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ILLUSTRATED

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New York City U. S. A.

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The Automobile
MAGAZINE

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Captain Kerosene

By I. B. Rich

CAPTAIN KEROSENE, as it came to be called, was the product of Frank Halstead's brain—on paper as yet—but destined to play a greater part in his future than he dreamed. But of that we shall hear later.

Halstead was a young mechanic in the large factory of the Continental Motor Vehicle Works, in Watsessing, N. J., and, like many another in the shop, he had large ideas of improving the motors. All bright mechanics have, but the new ideas are not always adopted, for various reasons, principally commercial.

Halstead was a college graduate who wanted to see and know the shop end of his chosen profession, and had gone into the shop to see the whys and wherefores for himself, as well as replenish his little bank account, which had been almost depleted by the drain of the last college year. He had evolved a plan for a motor to supplant the one in use by the aforementioned C. M. V. Co., and making a radical change in the fuel—using kerosene instead of gasoline, as was being done. He could tell you the heat value, the specific gravity of oils, and a lot of other things you'd forget before he was through, and prove without question that his was the only motor—and he believed it. Having decided on kerosene, he planned a motor to use it, and tried to interest the superintendent.

"Don't care anything about it, Halstead. It may mote and then again it may not. I'm hired to build these gasoline motors as cheap and as good as I can. If they get out a dynamite motor I'll build it. But you don't get your Uncle Benjamin into new schemes. Go to the G. M. with them, every one of 'em."

So the General Manager was approached, but proved adamant, even when the petition for a trial was seconded by his daughter, who was decidedly interested in Halstead, whether his motor ever moted or not, and in spite of his emaciated bank account.

" Why, look here, Halstead; even if your machine works you don't realize what it means to us to adopt it. We've got fifty thousand dollars' worth of special patterns, tools and fixtures which would be only good for junk. The experiments would cost ten thousand dollars, and what would the stockholders say to that? Say, 'let well enough alone,' wouldn't they? We've made a reputation on gasoline motors, they run well and there's a demand for all we make, so there we stick."

" But, Mr. Champlin, suppose another concern does go into kerosene and make it a success. You'll lose your trade and reputation, too. Why not be in the lead and give them either kind they want?"

" Well, I'll risk that sooner than the wrath of stockholders who are always looking for one per cent. more on their dividends. And now, Halstead, don't fool away any more time on that scheme. Improve our motors all you can, but don't get too new."

Of course, Halstead didn't stop—Champlin didn't expect he would—and he just couldn't, for two reasons. His mechanical ambition must be satisfied and—but this should have come first—he must have money before he could hope to make a home for the future Mrs. H., if all went well.

" It's no use, Margery," he said, after the interview; " I can't drop it. I've got to push it and I believe it will work, too. I shall see another man to-night who will back me, I think, and then I hope to make money enough, so somebody will change her residence some fine day. Good night, dear. I know you wish me all kinds of luck."

The other man enthused over the idea to the extent of backing him in the construction of the first carriage, and another week saw Halstead installed in a little shop, working early and late on his new motor.

Experimental work drags slowly and weeks lengthened into months until a year was close at hand before the machine was tried. It wasn't one of these successes you read about, where everything goes off without a hitch. Such things don't happen often in cold iron and steel, but it ran after a fashion, and the defects were located and remedied.

Mr. Champlin only heard the adverse comments, and he was anxious to help Halstead, for he liked his nerve in branching out

and trying things himself, but he wanted him back in the C. M. V. Co., and so made one more attempt to get hold of him—through his daughter this time.

"What's the use of his fooling, Margery? The machine don't go and he'll never make it a success. You better persuade him to come back to us. I'll make him foreman to-morrow and push him. But, of course, I can't consent to his marrying you while he is in an opposition company. The stockholders would swear I was in that, too. If he really wants you he'll do that much, I know."

"But he can't, father. It wouldn't be fair to Mr. Jones, who has furnished the money for the experiments, and his own reputation is at stake. You wouldn't want a man for foreman or superintendent who had failed. Oh, he'll make Captain Kerosene go and I'll go with him some day—or night," she added, under her breath.

"Must mean to elope," muttered her father; "well, I'll block that little game, I guess." But he changed his mind shortly after when he happened to hear a voices in the next room and caught the words, "I'll be here sharp at ten with the new one. Meet me by the drive and we'll see how quick Captain Kerosene will get us to Rahway. I've arranged things so there will be no delay, but——"; he lost the rest of the sentence in his merriment, for he chuckled to think of the capture of the elopers, the discomfiture of Halstead, and vowed he would have him in the C. M. V. works inside a month.

"Guess he doesn't know I've got one of the new machines here—one of our racers. Well, I'll have some fun with Halstead. Kind of hard on Margery, but she'll stand it. Plucky girl, that."

Slowly moved the clock that evening to three people, but the town clock boomed ten at last, and a small figure in traveling dress and cloak hurried down the drive. At the same time another figure, not small, walked rapidly to the carriage-house. "Don't want to catch them too quick," it said to itself; "guess I'll wait a minute."

Halstead and Captain Kerosene were waiting, and after assisting Margery to her place, he lit his lamps and climbed in, throwing in the low speed gear as he did so, to be followed by the high speed gear a half minute later.

A light flashed in their rear and they turned to see her father's machine surging into the road from the drive.

"That's father's new racer, Frank. I was afraid he overheard our plans to-day. Found him in the next room trying not

to laugh, just after you went. Good machine he's got, too, but I have faith in Captain Kereosene to-night, dear; but keep him on high speed, for father's new machine is a flyer."

"Glad of it, Margery. Want to show him what Captain Kerosene will do. But it means a hard run to beat him to Rahway long enough to have the ceremony over before he comes, but we'll try it," and he pushed the sparking lever to the last notch.

"Don't worry, Frank; I'm sure we'll beat him if we don't break down. Father isn't a man who gives up easily, but I think we'll be all right if we keep on like this," for they were flying now.

The valley road lay in white patches in the moonlight, while the lonesome street lights threw fantastic shadows along the road before them. Up, now, till South Orange lies below them on the left and on the rising hill beyond. Street lights in the distance are the only sign of life and even they are fading as Maplewood is neared—and passed.

"What's that," as a decided slowing down occurs, and Frank shuts off the power, jumps from the carriage and grabs one of the lamps. "Better see what it is before your father comes in sight," and he goes behind to investigate. Not the best work for a dress suit, but circumstances alter cases.

"Its the sparker," he said; "seems to be weak. Don't understand it, for I put in a new one this morning. Batteries may be weak, but ought to be all right. No connections loose; that'll fix it. Wonder what's become of your father. Couldn't take any shorter road than we have and he wouldn't do that, I don't believe; he'd race fair. Hope he hasn't gone in the ditch."

"Oh, he's a good driver, Frank, and maybe his connections are loose, too," and she smiled a little. Under ordinary circumstances Frank would have wondered, but he took smiles and everything else as his this time and didn't inquire further.

Meanwhile Mr. Champlin was having troubles of his own. Starting out in high glee at the chance of a race, he talked to himself as he went along, for want of a better companion.

"I'll give him a run for his money, anyhow. Rather like his nerve and there's no doubt he's bright. But to think of his daring to run away with a girl—my Margery, at that—in a new machine that's hardly run at all. I'll have the laugh on him before we strike Maplewood, and then—what's that? Slowing down, as I live! Didn't know I moved that sparking lever. No; that's on full. What in blazes is the matter? Oil open wide,

too. Stopping, by jingo, just as I was gaining on him. Well, I must have a look at it, any how; acts as if the oil was out; tanks were full this morning, I know. Empty, as I live; ought to have looked before I started. Well, here's some in the extra can. Won't delay much, after all. Now we'll start again. Oil don't smell just right, but I guess that's my imagination. Won't run, eh—won't even start. Never knew a C. M. V. motor before that wouldn't start. Nice recommendation for the only machine on earth when the general manager can't start it. Chasing an elop-ing daughter, too, and can't start the motor. Halstead's prob-ably flying like a scared rabbit, too."

"I wonder if Halstead would play a trick on a man." Then he drew a little of the oil into the cover of the can and took it to the roadside to test it; lighted a match, but it wouldn't burn. "Water, by jingo; not even kerosene. Now the next question is, who did it? Nice pickle I'm in, here in South Orange. Have to haul the machine out of the road and go home in the train. If Halstead did that he's no son-in-law of mine, if he did beat me to Rahway."

Halstead and Margery reached Rahway without further inci-dent and were united as the clock sounded the close of the event-ful day. Returning the next morning to receive the parental blessing they found Mr. Champlin by the roadside getting the machine ready to run home.

"Sorry you broke down, Mr. Champlin; I wanted a good race, just to show you what Captain Kerosene could do," said Halstead, as he slowed down.

"Didn't break down; C. M. V. motors don't break down. Some one nearly drained my oil tank and filled the supply can with water. 'Course you don't know anything about it?

"No, he doesn't, father; I did that. I thought you over-heard our plans when I found you in the next room laughing. Of course, I knew Captain Kerosene was all right," with a smile at Frank, "but I wasn't going to risk being caught when a little forethought would prevent it. Left enough to get you well away from home, then filled the other with water. Nothing like a little forethought, you know, father. Now, what will you do to the culprit?"

"Kiss her and we'll all go home together. Got ahead of me that time."

Legal Decisions Affecting the Automobile

By W. M. Seabury

DECISIONS by the courts of the various States in this country affecting motor vehicles and all horseless carriages and their rights upon the public highways have, up to this time, been extremely few and far between.

It is not difficult to account for this lack of legal decisions affecting motor vehicles in this country when it is remembered that the calendars of our courts in many of our cities are overcrowded with cases awaiting trial.

In New York County the calendars of the Trial Term of the Supreme Court are so crowded that it takes at least two years for a case to be reached in its regular order. Kings County is little better than New York County, and we have no doubt that a condition of affairs similar to this is not at all unusual in cities in other States.

After the trial of a case in New York County a year may easily elapse before a decision of the court of last resort is obtained finally disposing of the issue involved.

The case of Fred. Nason *et al. vs.* Jonathan B. West, reported in 31 Misc. R., 183, is the first case in New York State which we have been able to find in which a motor carriage was involved.

In this case, as it will be remembered from our issue of September last, a runaway was caused by a horse taking fright at a motor vehicle on the public highway at Rochester, New York.

The case was tried in the Municipal Court of Rochester and from a judgment rendered on a verdict of $42.95 in favor of the plaintiff the defendant appealed to the County Court.

It will be remembered that Judge Sutherland, of the County Court of Monroe County, reversed the judgment, and in holding that there could be no recovery in the case, said: "The horse has no paramount or exclusive right to the road, and the mere fact that a horse takes fright at some vehicle run by new and improved methods and smashes things, does not give the injured party a cause of action."

This case was argued at the May, 1900, term of the court and has already attracted considerable attention. We have heard that it is now on its way to the Appellate Division of the Supreme

Court, and that a decision from this court may be expected at some future time.

The views expressed in the opinion of Judge Sutherland have met with favorable criticism. In commenting upon the case it is said in the October, 1900, issue of the New Jersey *Law Journal:* "Good new law is based on good common sense, and we suspect that common sense is back of this opinion of Judge Sutherland. It is true that the introduction of bicycles, trolleys, automobiles and similar methods of conveyance, and unknown to our ancestors, have caused many accidents, especially from the frightening of horses, and this is to be deeply regretted, but how can it be otherwise? In time horses will become as fearless toward these new conveyances as those brought up in the vicinity of railroad tracks usually are of locomotives. At all events, they must get used to them and the public must get used to them. There can be no other solution of the problem than that all these modes of conveyance must have equal rights upon the public highways, and while it is true they may cause accidents for the present, the ultimate benefit to the public at large is greater than most of us can now foresee."

It is evident from the statement of the case of Guyre *vs.* Vroom, contained in this same issue of the New Jersey *Law Journal,* that Mr. Justice Dixon, of New Jersey, does not entirely agree with the views of Mr. Justice Sutherland of New York.

This case has not as yet been officially reported, but from the account given of it in the journal referred to it appears that a man named Guyre, who was an Erie Railroad conductor, brought suit against Dr. Vroom for damages for the loss of his wife. It seems that Mrs. Guyre was driving at Midland Park when Dr. Vroom's automobile, being beyond his control, backed into the horse driven by Mrs. Guyre. The animal became frightened and ran away, throwing Mrs. Guyre from her buggy and inflicting injuries from which she afterwards died.

Dr. Vroom's testimony was to the effect that the horse became frightened when two hundred and seventy-five feet away from the automobile, which Dr. Vroom stopped upon seeing that the animal was afraid.

Dr. Vroom maintained that he had the machine under perfect control, and gave an exhibition in front of the court-house to show the Court and jury his ability to handle it. Mr. Justice Dixon in his charge to the jury said: "The first question to which you come for the purpose of deciding the defendant's responsibility is whether this machine was a nuisance. You have seen how it was operated. You have heard the witness describe

the mode of operation, and the question rests with your sound judgment as to whether the machine, driving along country roads without a horse in front and discharging steam behind, is likely to frighten a horse on the highway and thus endanger the road so as to constitute the machine a nuisance. It is agreed that it is an improved method of locomotion, but it does not follow from that that it is to be tolerated. The right to drive horses along the highway is an established right, a common right, and if a modern method of locomotion is used of such a nature that it commonly brings discomfort and danger to those exercising the common right, the established right of travel on the highway, then it is a nuisance and cannot be tolerated. If it occasionally or exceptionally frightens horses that would not make it a nuisance. In order to make it a nuisance its common effect must substantially interfere with the people who drive horses along the highway."

The jury remained out a few minutes and then returned for instructions upon certain points, at the same time informing the Court that they had agreed that the automobile was not a nuisance. The jury returned to their room and remained, considering the case, all night; finally disagreed and were discharged.

We agree with the views expressed by the New Jersey *Law Journal,* and regard this decision as not altogether sound.

The Automobile Show at Madison Square Garden

THE First Annual Exhibition of Automobiles, under the auspices of the Automobile Club of America, has been held and was in every respect a decided success. This success was assured the opening night when, in spite of the fact that the city was ablaze with political frenzy, a large number of people turned out to do homage to the new mode of conveyance.

The show was pre-eminently one of automobiles and their accessories. The public was promised nothing else but this, and so many visitors on the opening night speaks well for the great interest which is being manifested in the automobile, as well as for the gentlemen who planned and completed the arrangement of the exhibition.

On several occasions representatives of some of the best known families of the country were present, which gave it a high social aspect.

One very striking thing about the show was the great seriousness with which visitors inspected the different vehicles, and as though they meant business.

The exhibits were greatly admired by all present, and a feature which added materially to the show was the opportunity for seeing the vehicles in motion as well as affording a chance for visitors to take a ride in the vehicle which pleased them more than did others.

The first contest was held on the night of Monday, November 5, and was confined to electric vehicles. The total distance traveled was about 200 feet and it was held on the Twenty-sixth street side of the track. Start was made by a pistol and the first obstacles were rows of barrels set across the track. The track being 20 feet wide and the openings being alternately on opposite sides of the track, necessitated sharp turning to go through successfully. The vehicle described the course of a Virginia rail fence. Then the vehicle was run into a pen with sides arranged so that the driver was forced to back out through another opening, and then go forward out through still another opening, forming a sort of a maze. Then the contestant had to go through a curved line of barrels. The pen or maze appeared to be the hardest impediment to negotiate successfully, as it required stopping,

backing out at quite a different angle, stopping again and going forward at still another angle. In their anxiety to do this quickly most of the contestants had some part of their machine touch the sides of the pen. The tread of the wheel varied from 4 feet 6 inches to 5 feet, and the sides of the pen were shifted to allow the same clearance for all the vehicles. The winner was Walter C. Baker, of Cleveland, on a Baker runabout, whose time was

Inclined Track of the Mobile Company's Exhibit

25 seconds, he touching the least number of times with his hubs. The second man, Edward Adams, who operated a Riker vehicle, was not very far off in time, he doing it in 27⅖ seconds, but even though he lost on time he would have lost otherwise on the number of obstacles he hit. Others went through in times ranging up to 35 seconds and colliding with obstacles almost every time they had to go near one. This con-

test proves nothing about the vehicle, it being entirely a matter of skill with the operator. The winner went through the ordeal with so little concern that his superiority was even noticed by the spectators, who, after each of his two trials, gave him plenty of applause. The judges were T. C. Martin, R. A. Fliess and Dr. S. S. Wheeler.

These contests aroused a great deal of enthusiasm. Many prospective purchasers were influenced by the time certain vehicles occupied in getting between the obstacles, but it would seem that the more important thing would be the number of obstacles disturbed while running. There can be no doubt that the factor of able manipulation is an important one, and while a certain carriage may cover the distance in a shorter time than some others much depended upon the operator. It is better to go slow than to run fast and have such running result in accident. The question of safety must forever be uppermost in the minds of those who both manufacture and operate motor vehicles.

Similar contests were conducted on the evening of Tuesday, November 6, which were confined to gasoline vehicles only. The following firms were represented: The International Motor Carriage Company, Ohio Automobile Company, Holyoke Automobile Company, and the Automobile Company of America. The winner of the obstacle race was a vehicle of the last-named company.

Society was again in evidence on Wednesday night. Not only was there an excellent attendance, but many fashionable folk were observed in the boxes watching the endless procession of swift moving vehicles or in the arena listening to the explanations of the exhibitors as they lectured on the superior merits of their respective products.

Among the well-known people present during the afternoon or evening were Mr. and Mrs. Edward McVickar, Mr. and Mrs. H. B. Duryea, Mrs. Hermann Oelrichs, Mr. and Mrs. H. Mortimer Brooks, Miss Gladys Brooks, Woodbury Kane, Frederick Gebhard, Lorillard Spencer, Jr., Mr. and Mrs. Hamilton Cary, Albert C. Bostwick, A. Gordon Norrie, Mr. and Mrs. Alfred de Cordova and Mr. and Mrs. Clement C. Moore.

An incident of the afternoon was the arrival of a military motor-cycle, built by the Mobile Company of America, carrying four National Guardsmen, with their rifles and equipment, including 1,000 rounds of ammunition apiece, shelter tents, blankets, cooking kits, and intrenching tools. The vehicle made the run from Tarrytown, 31 miles, in 65 minutes. It is steam propelled, 12 horse-power, and weighs 1,500 pounds. It joined in the pro-

cession about the arena and attracted a great deal of attention. This wagon is one made as a result of a suggestion of General N. A. Miles, of the United States Army.

There were no special contests, and in consequence a much larger proportion than usual of the spectators was able to try a ride in the vehicle which took their fancy. All the carriages were well patronized, except the delivery wagons and the small two or three wheeled varieties of artificially propelled vehicles.

Military Wagon of the Mobile Company of America

Several visits to the show were necessary for the average visitor to obtain even an approximate idea of the extent and variety of the many devices shown, particularly those of auxiliary use. An ingenious application of the "coin in the slot" idea was shown in an "electrant" designed to supply electricity as a hydrant supplies water, after the necessary coin is deposited, of course.

It is an iron construction about a foot square and four feet high. The *chauffeur* inserts a plug, which he must carry with him, and establishes a connection with his batteries. The contact allows a door to open, in which is the slot and a switch. Upon depositing a quarter in the slot and shifting the lever enough electricity to propel an ordinary electric vehicle a distance of 25 miles is obtained. It is expected that these automatic devices will be installed in suburban villages and places on the main lines of travel between important points where an electric vehicle might otherwise become stalled for lack of power. The power of the electrant is derived from a dynamo.

The number of carriages on the track was quite large, and the many styles and colors, together with the variety of costumes worn by those occupying the carriages, gave to the scene a fairy like appearance. There was an unusually large gathering assembled in the gallery, but for some reason or other the contests which had been arranged for steam vehicles did not take place, much to the disappointment of a great many persons present.

An exhibit which attracted considerable attention was that of the Mobile Company of America, who rented the entire space on the roof garden. The hill climbing exhibition evoked much admiration, and, as will be seen from the illustration, the performance is really remarkable. There are three different grades: the first being 40 per cent., the middle one 45 per cent. and the third leading to the tower being 35 per cent. The carriage ascends at the rate of 12 miles per hour. In descending the first grade is made with the vehicle backing. When the first halting place is reached the carriage is turned round and descends front first. No one can just realize what such a grade really is until they attempt to walk up and down.

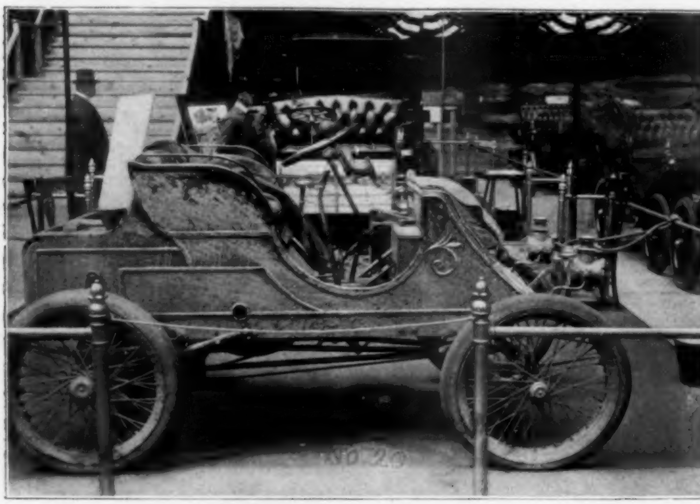
The Mobile Company had a large number of one-seated and two-seated vehicles, delivery wagons, etc., on exhibition, its carriages being in great evidence on the track.

Winton's racing carriage, in which he came overland from Cleveland to New York, was almost continually surrounded by visitors. The vehicle was covered with mud and served as an excellent object lesson as to what some vehicles can stand in the way of rough usage. The vehicle came from Cleveland to New York in a little over thirty-eight hours, which gives an average speed of 21 miles per hour.

The Paragon Insulating Company, of Cleveland, showed an exceedingly interesting thing in the way of a charging plant suitable for private use, in which a compact gasoline motor is directly connected to a shunt-wound dynamo, carrying an out

board ring oiling bearing and wound for the voltage required by the batteries. The apparatus starts, runs and stops automatically, and the engine uses either gas or gasoline.

Thursday proved to be a red letter day in a number of respects. The attendance numbered about 6,000. Large numbers of machines were constantly on the track and the evening brought a number of amusing incidents connected with the contests. For some reason the exhibition management succeeded in instilling more enthusiasm on the part of exhibitors to enter the competitions, which made it more representative than had been the case previously, owing to their backwardness to enter. The novel



The Winton Racer

character of the steam tricycle contests seemed to strike the crowd just right, and they evoked much laughter and amusement.

A starting contest for gasoline vehicles was won by the "gasmobile" of the Automobile Company of America.

The Loan Exhibit of the Automobile Club of America was very interesting and was inspected by a curious crowd almost continuously. Among the more interesting exhibits included was an exact duplicate of Dudgeon's carriage built in 1860. This is a crude affair, although the arrangement for warming the feet of passengers is quite original. Then there was the steam bicycle of S. H. Roper.

Automobile Show at Madison Square Garden

The Panhard machine of Grant Lyman, which was attended by his French *chauffeur,* Julian Blanchard, was the centre of much interest. It has a 12 horse-power motor. The automaton shown in the attitude of pushing an invalid's chair and several other interesting relics of the early days of attempts in connection with self-propelled vehicles proved quite instructive and formed a striking contrast with the more modern vehicles shown in the arena of the Garden and on the track.

The first gasoline vehicle built in America also interested a great many by its striking appearance as compared with the machines about it. This carriage was built in 1893 by Haynes & Apperson, of Kokomo, Ind., and one of the builders informed us that when it was shipped from Kokomo for New York it was run to the depot under its own power. Many miles were covered by Mr. Haynes in it during the years 1893, 1894 and 1895.

Friday was a busy day for all hands, as the number of visitors still was large. The great feature of the day in the way of tests was brake and obstacle contests for delivery wagons.

At the close the exhibitors and members of the Automobile Club of America adjourned to the assembly room, where a banquet was held. Vice-President Albert C. Bostwick presided in the absence of Albert R. Shattuck. Speeches were made bearing upon the different features of the show.

Five electric delivery wagons entered for the quick stopping contest, a run of 100 feet being required and then stopping as quickly and within as short a distance as possible. The distances varied from 6 to 23 feet, and the times from 5⅘ seconds to 8⅗ seconds. In the final heat the vehicle that made the quickest time before won in 6⅖ seconds, stopping within 10 feet and 7 inches.

The obstacle race had seven starters, all big vehicles, and every one bearing names of well-known New York firms. The winning wagon came up to the requirement in 1.01⅕. There was a decidedly practical element in these contests, for it demonstrated what huge delivery motor vehicles are capable of doing on the public streets in averting accidents. The suddenness of the stop when going at a lively pace was a distinct revelation to a large proportion of the spectators.

Saturday, November 10, saw the closing day of the exhibition, and it is safe to assume that the members of the Automobile Club of America, exhibitors and visitors alike look back with great satisfaction upon the success of the enterprise from every point of view. The attendance on the closing day was as large, if not larger, than it had been on the previous days. There was, how-

ever a feature of the exhibition which was felt keenly by many of the visitors, and that was the failure to carry out all the contests and races as arranged. There were many who were especially anxious to witness these, and on more than one occasion visitors were heard to express themselves very forcibly about the matter, and such expression was entirely justifiable, for no matter how little disappointment the failure to hold certain contests may have caused those exhib-

Stanhope of the National Automobile and Electric Company

iting it was a source of great disappointment to many visitors. There may have been good reason for this omission, but it is hoped that on future occasions it will be arranged so that those who attend will see all they have been promised.

A number of the exhibitors at Madison Square Garden also had space at the Grand Central Palace Show held from November 14 to 24, and simply moved their carriages from one building to the other.

Automobile Show at Madison Square Garden

We were unable in some instances, owing to lack of time in which to make necessary illustrations to present views of a number of exhibits made, and take pleasure in giving our readers a chance to see and read of these, for while a number of our readers visited the show there are others who were not able to.

The National Automobile and Electric Company, of Indianapolis, exhibited eight different vehicles, of which we illustrate two, the break for four passengers and a Stanhope. The first-

Four Passenger Break of the National Automobile and Electric Company

named vehicle is fitted with a 2½ horse-power motor, its radius of action being about 45 miles.

The Stanhope shown has graceful lines and is capable of running 45 miles on one charge.

All vehicles shown by this company were fitted with electric power, electric lights, electric alarm bells, fully equipped with Weston combination meters and all modern appliances.

The exhibit of the Automobile Company of America, Marion, N. J., was a very attractive one and was very much admired by the people. The carriage with white body and pig skin trim-

mings was considered a thing of beauty, while the delivery wagon which we illustrate was a favorite.

Two Stanhope phaetons of the same type as the winners of the first and second prizes to American-made machines at the Guttenburg races were shown. The motor is of triple cylinder design, compact in form and very powerful. The vaporizer, supplying the three cylinders, is of the constant level type, and the ignition is by a jump spark. Two forward speeds and the six-mile reverse are inclosed in a dust-proof case. All intermediate speeds are obtained by throttling the mixture, and this tiny throttle effects the changes instantly. The motor, transmission gear, tanks and body are fastened to the bar iron frame, and this entire

One of the Carriages of the Automobile Company of America

weight is carried by four semi-elliptic springs between the axles and the frame. Great flexibility of wheel support is thus obtained. These are ideal touring carriages, the tank capacity of both water and gasoline being sufficient for a day's journey. The radiating coils under the tool boot in front reduce the amount of water to be carried four-fifths. No oil cups are seen and the wheels and shafts have roller bearings. Steering is done by a side lever, this insuring quick action. Foot pedals control the reverse clutch and the brakes on the rear hubs, and the 32-inch wooden wheels have 4-inch tires.

A most luxurious surrey formed another type shown. This is equipped with a hydro-carbon motor of multi-cylinder design,

Automobile Show at Madison Square Garden

Delivery Wagon

The "Gasmobile" of the Automobile Company of America

developing power for a 25 per cent. grade. The same simplicity and strength of mechanism, the same thoroughness and finish of detail found in the Stanhopes are evident here, and, indeed, characterized each feature of this exhibit.

A graceful Victoria in red and green attracted much attention and at the east end of the exhibit, under the electric "gasmobile," the different parts of the automobiles were artistically arranged for inspection. These vehicles are built on the interchangeable

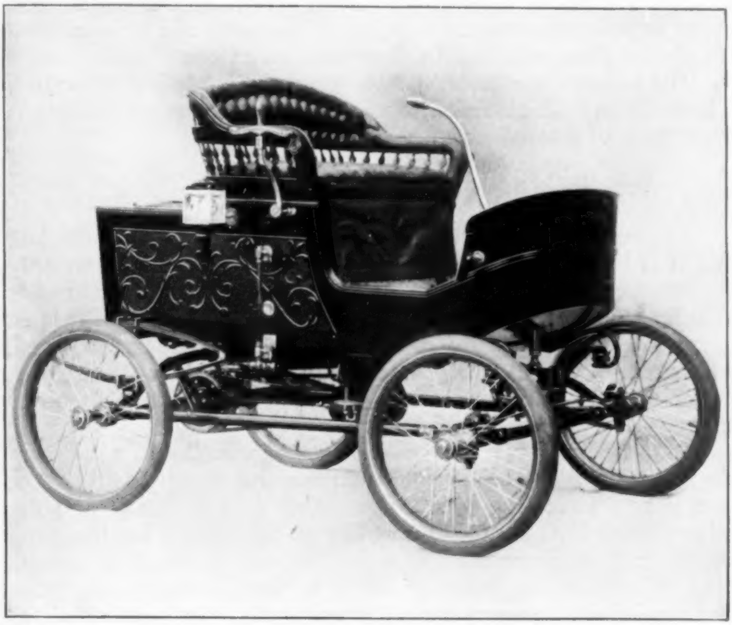
Three Seated Carriage of the Haynes-Apperson Company

plan, and with the exception of the tires and wooden wheels, the entire output is manufactured by the company at its plant at Marion, Jersey City, N. J.

Haynes and Apperson Company, of Kokomo, exhibited two or three vehicles. This firm is one of the pioneers in the successful manufacture of motor vehicles, and has done a number of very creditable things. Their factory is running full blast at present in order to keep up with orders. We present illustration of this company's six-passenger automobile, which, as will be

seen, is provided with three seats, each one a little higher than the other, enabling passengers to get an unobstructed view of the country while riding.

These carriages are substantially built and fitted with a 12 horse-power engine, which will take the carriage up a 20 per cent. grade. The speed of the carriage is 15 miles per hour. The seats are very wide, and eight passengers can readily be accommodated.



The "Toledo" Steam Carriage

One of the new things in the way of steam driven vehicles was that of the American Bicycle Company's, known as the "Toledo" carriage. From the time it was brought into the Garden to the time it was taken out again a curious crowd surrounded it during the exhibition hours, as certainly it was a beautiful example of automobile building. It is standard gauge tread, carries 36 gallons of water and 9½ gallons of oil. The running gears made up on 1¾, 14 and 16 gauge tubing with a patent device on the steering lever which removes all vibration

The arrangement of a pump in combination with the steering lever is such as to render it possible to pump water to the boiler when running, if necessary.

The engine is of the simple two-cylinder type with piston valves. The stroke is $3\frac{1}{4}$ by $4\frac{1}{4}$ inch, developing $6\frac{1}{4}$ horse-power at a steam pressure of 200 pounds to the square inch. The boiler is of a new water tube type, having eleven tubes and a double shell. This boiler steams very rapidly. Air is supplied to the air tanks by a power air pump driven by the engine, and is put in and out of commission by the pressing of a plunger with the foot. Reverse and throttle lever is all in one.

The carriage is decidedly handsome and is a thing of beauty. The body is of high finish, and everything about the vehicle is suggestive of a reliable and serviceable carriage.

The automobile seems to be something more than a mere fad, and it is by no means true, as is very often supposed, that only wealthy people have serious thoughts about owning a motor vehicle. A man interested in the sale of automobiles informed us recently that in many instances inquiries come from people whom one would least expect were considering the purchase of a motor carriage. From all sorts of unexpected sources inquiries and requests for information come.

" I'm thinking very seriously of getting one," said a milkman the other day, " and I will tell you the reason why; within the past year I have lost two horses. One cost me $150 and the other cost $165. I could almost buy an automobile for that, and the automobile wouldn't die on my hands. It wouldn't eat its head off, either, nor would it fall down and break its legs. So, you see, it isn't as funny for a milkman to have an automobile as it sounds."

The above contains a great deal of horse, or, we should say, " automobile," sense, and is only one instance of how the new method of transportation is taking hold of commercial as well as social life.

The Horse's Ode to the Automobile

Oh, Auto!
You insensate bundle
Of wheels and gears,
And things,
Without ancestry or hope of posterity,
Do you ever lay the flattering unction
To your soulless
Mechanism
That you can
Supplant me?
Me! The helpful
Aid to all the race of human kind;
The beast of burden;
The wheel horse
Of Victory of every epoch
In the struggles of
Humanity
From the days of Elijah
To the present time!
What were the Crusaders
In their search
For the Holy Sepulchre;
And the spreading of
The Word?
What the Armies
Of Alexander,
Of Cæsar,
Of Napoleon,
And all the wars
Of all the conquerors
Of National Fate
And human destiny
Without me and mine?
We who are sons and
Brothers to the sentient
Creatures,
Who swept the
Plains of Marengo
And Austerlitz,
And made the world ring
With the daring
Of Balaclava?
Go to, you Auto!
You painted toy.
When you get through
Your rubbering
And your bumping,
And your puncturing,
Turn you your eyes
Upon me with
Envy for the thing I am
And always will be;
The joy of men,
The pet of women.
You will never know
The tumultuous thrill
Of God's creatures,
As when I am leader
In the race.
Perish the thought!
I am son of
Alexander's Bucephalus
And brother to Rienzi.
The steed
As black as the shades of night
Who brought
Sheridan
All the way
Down from Winchester
To save the day.
If I had not,
And you had been IT
What would
Phil have done
That bright September morn
With a punctured tire
And a slipped eccentric?
The affrighted air
Would not have borne
The herald of

Victory:
But the spiltherinktums
Of a heap of scrap.
When from the palsied grasp
Of Man
The sceptre falls.
And the earth is
Shrivelled to a scroll,
You may hitch
Your wagon to the stars
And find the planets,
Having lost their heads,
May tie to you;
But until then
Whisk and whirr
But don't think you're in it
With me.

—*Ex.*

Book Reviews

"Motor Vehicles and Motors." By W. Worby Beaumont. Published by J. B. Lippincott Company, Philadelphia. Price, $10.00. This is a most exhaustive treatise on the design, construction and operation of motor vehicles driven by steam, gasoline and electricity. The book ought to be of real assistance to engineers and motor vehicle constructors. The information it contains is explicit, definite and reliable. The work is profusely illustrated, while the press-work is excellent. The author devotes some space to early vehicles, road resistance, frictional losses, air and wind resistance, carbureters, etc. The book is an admirable one and great pains have evidently been taken to make it so. It contains 636 pages and is bound in cloth.

The chapters originally intended to be written by Dugald Clerk on the physics and economics of internal combustion motors will appear shortly as a separate volume. The whole work is excellent, and the publishers as well as author are to be complimented.

The Electric Automobile: Its Construction, Care and Operation. By C. E. Woods. Published by Herbert S. Stone & Co., Chicago and New York. Price, $1.25. The author goes into the introduction of automobiles, giving a number of illustrations of some early carriages. Other chapters deal with carriage construction, operation and care of electric automobiles, construction and use of storage batteries, the operation and control of motors as used on automobiles. There are numerous illustrations of different types of motor vehicles. To users of electric carriages this book ought to prove of great value. It contains 177 pages and is bound in cloth.

Motors and Motor Cars: Their Defects and Remedies

A PAPER bearing the above title was recently read before the Cycle Engineers' Institute by Charles T. Crowden, and below we print extracts from it:

It is not proposed to go into the historical part of the subject, but it may be mentioned that a machine was constructed by Mr. Edward Butler in London between the years 1884-1886, at the same time as Messrs. Benz and Daimler were at work in Germany. The machine, which was called the petrol cycle, was very much like the Bollée machine afterwards brought out, and was not further developed because of the "Red Flag Act," which did not allow its use in England. At the same time Mr. Butler also constructed a high speed oil motor or engine to run from 800 to about 1,000 revolutions per minute. At this time there were no gas or oil engines which would run above 180 to 200 revolutions.

Motor cars cannot take their supply of gas from the street mains very well, so a portable gas works, or "carbureter," is carried, in which air, during the suction stroke of the motor, is drawn through or over a volatile spirit called petrol or gasoline, having a specific gravity of .680 to .700. What is a carbureter? or what kind of carbureter should be used? many people inquire, especially those who have a thirst for motor philosophy. The carbureter is a vessel in which a small quantity of petrol or hydrocarbon is carried and mixed with air in a regulated quantity to suit the motor. Firstly, the air can be drawn across the liquid; secondly, the liquid can be sprayed through a vessel; thirdly, the air can be drawn across a saturated cotton or gauze wick; or, fourthly, the oil can be injected into the motor direct at each suction stroke. The suction of the motor causes the gas to be generated when wanted in sufficient quantities to supply the motor and effect complete combustion without smell. Carbureters may be divided into the following classes: Firstly, surface carbureters; secondly, spray carbureters; thirdly, wick carbureters; fourthly, petrol ejected, with air supply, direct.

Lubrication is a most important point in connection with the successful working of motors. Gas or explosion engines would have been possible years before the days of Lenoir, Otto, and others, had some one come forward with a mineral oil to lubricate it with. The heat of the explosion, the temperature of which is

about 800 to 1,000 degrees Fahr., should pass through the walls of the cylinder, after every power stroke, to the water jacket. The temperature of the cooling water ought not to exceed 180 degrees Fahr., or else the oil will become congealed in the motor cylinder. The cylinders themselves also become distorted, the valves stick up, and various other troubles present themselves, which have led the author to the conclusion that even for small motors a water jacket is required to get the full power of the motor, and to get rid of the offensive smells of unjacketed motors.

Some men have clipped or threaded radiating ribs on to their cylinders. Now to get the thorough effect of radiating there must be a continuity of substance. Heat will not pass through separate bodies as through a solid one. The rings should be tongued at the joints. In this respect, what will do for a steam engine practically will not do for gas or petrol engines. A still further improvement may be looked for in this respect. A compression of over 100 pounds, or more if it could be maintained, would be the means of increasing the power of the motors considerably.

Great attention should be paid to the valves to see that they are seated properly, and they should be ground in with rotten stone, not emery. It does not much matter whether the seats are mitred or flat. The valves and valve seats should be made renewable and separable from the motor, so that spare ones can interchange, as the fault is not always with the valves themselves, but with the valve seatings, which are usually made a part of the motor. The same pattern of valve could serve both for the inlet and the exhaust, and in the case of a double engine one pattern of valve may serve for both cylinders. Instead of lift valves Mr. Butler still uses a revolving valve that travels at half the speed of the motor. The author has seen these valves taken out after working for a month, day and night—resting only on Sundays. The valve is similar to a Corliss valve, revolving instead of reciprocating. A black oxide forms on the wearing part of the valve or seat, which makes it almost impossible to touch with a file. As these valves have now been running successfully for about fourteen years, they are worth the attention of motor constructors. The valve springs in use on most motors are far too short, and ought to be longer. Valves, pistons and rings should be thoroughly cleansed in paraffine, and the crank shaft turned round some forty revolutions when the motor is not in use. This would largely prevent the sticking up of valves, tight pistons, etc.

A motor car engine should be constructed as light as possible, without any signs of springing or contortion, remembering the

force of the explosion acting on the piston, say at 600 or more revolutions per minute. The moving parts also should be as light as possible, and balanced. As far as the piston, connecting rod and crank go, the fly-wheel may be suitably weighted, and should be as large as possible, and heavy. Even then a large amount of vibration will exist, especially when the car is stationary, and the motor is running as slowly as possible. The vibration is not felt when the car is traveling slowly, and, to my mind, is more imaginary than real. The motor car is for traveling purposes, not for standing still at corners to shake up its passengers. If motormen must stay at corners, let them stop their motors and then start them again when required. To get rid of this so-called difficulty, motors are made with two or more cylinders, arranged in different ways to partially balance themselves. Not only do the moving parts require balancing, but the explosions also. Firstly, take a double-cylinder motor, with the cranks set opposite one another. Here all the moving parts are balanced, but not the explosions, and there is an impulse at every one-and-a-half revolution. Secondly, take a double-cylinder engine, cranks set together. Here we have motor parts unbalanced—impulse or explosions every revolution. Explosions or impulses are more regular, but not balanced. Thirdly, take a single-cylinder engine, with piston and cranks, as usual, instead of a back cover, another piston having a cross head with two connecting rods, one at either side, coupled on to cranks set together opposite to the centre crank, so that the pistons meet and recede from one another at each revolution. This, in the author's opinion, is a very rude practical attempt at balancing. The side connecting rods can never be made to work without knocking, and that even at slow speeds. Fourthly, take a single cyclinder, open at both ends, with two pistons, each piston connected with a rocking beam, and each rocker connected to a single crank by the connecting rod; here there is perfect balancing of parts and explosions, but at the expense of increasing the number and weight of moving parts. Fifthly, take a single-cylinder engine of the simplest construction, and the moving parts made as light as possible, heavy fly-wheel balanced for its intended speed, moving parts which are partially balanced by the fly-wheel and balance-weight. The centre of the fly-wheel should be placed in the centre of the car, and revolve in the direction in which the car travels. All these so-called balanced engines have been made and tried, and as they were more complicated to keep up and more expensive to manufacture, and not suitable for running at high speeds, the author considers

for a motor car a one-cylinder engine, with simple parts, get-at-able on the road, far more useful than these complications.

The oil or petrol motor, unlike the steam engine, cannot be readily started and stopped, and therefore must be kept running whether the carriage is at rest or going full speed. A governor is usually fitted to control the working number of revolutions. Other means for slowing down the number of revolutions when not required are sometimes fitted. With the use of steam the motor can readily be started and stopped, as long as sufficient steam can be supplied from the boiler or steam generator. With the petrol motor a friction clutch, a transmission gear, and a change speed gear are required. With the steam engine, instead of the foregoing, a troublesome steam generator is required, with its cleaning of tubes internally and externally, which ought to be done every week. In the case of steam motors, water and fuel can be carried to last from twenty-five to thirty miles running. Oil fuel is too expensive in this country (England), but it is very convenient, as the heat can be easily regulated to make the necessary steam required to drive the motor over the various roads to be traversed.

Most motor manufacturers put their engines anywhere convenient—many in one corner of the frame, some in front, and some behind. The motor should revolve in the direction the carriage is traveling, and if one fly-wheel be used, this should be placed on the centre line of the car; if two fly-wheels are used, one each side of the centre line. Motors arranged in this way will steady the carriage whilst traveling and will minimize the vibration and prevent it from capsizing. Fly-wheels placed horizontally will give even better results. Most makers fix their motors too near the ground, so that they are difficult to adjust and repair, being more or less in the dust and dirt. Motion is transmitted from the petrol or continuous running motor by means of a friction clutch or change speed gear. For driving a differential countershaft or axle by means of chains or spur gearing at least three or four changes should be provided. To change the speed-gear wheels it is first necessary to withdraw the friction clutch, then make the change in the gear, and lastly put the friction clutch slowly in again.

The road carriage or truck should be constructed much stronger than for horse draught to do the same work, as it must be remembered that the horse is carried as well as the load, and that the driving strain of the horse is to be taken up by the carriage. The wheels must be stronger, as they have not only to carry the load, but to drive it along as well. The tires should be

elastic; solid rubber tires are the best known at present. Pneumatics are far too expensive, and on some roads very dangerous. The vehicle should be fitted with a strong and well-constructed steering gear, and with a band brake, operated by a foot lever, acting on the differential gear shaft. There should also be a powerful lever brake acting on both rear wheels as an emergency brake. A device should be fitted for preventing the car from running back downhill in case the motor should fail. The body should allow access to all the machinery, so that it can be adjusted and examined without removal. For examination at home the body should be easily removable, without disturbing any levers or machinery of any kind. The author would urge the necessity of using the very best material and workmanship in the construction of motor vehicles. Inferior and cheap materials are useless. To work motor cars successfully, especially petrol engines, cleanliness is the great secret of good running. Stoppages, or so-called breakdowns, are, in nine cases out of ten, due to negligence, forgetfulness, or dirtiness on the part of the operator, and it is by serving a course of failures and trials, which are disappointing at the time, that one becomes sufficiently wise to prevent the same occurring again in the future.

After the reading of the paper a discussion took place in which Messrs. Sturmey, Staner, Hewitt, Warner, Jones, Craig and Leechman took part.

The following lines have been written by Mr. Henry Edmunds, a well-known automobilist of Great Britain:

You may ride on a horse, or a mule, or a moke,
You may drive in a carriage, or sail in a boat,
You may swim in the water, or fly in the air,
Go just as you like, but only take care;
You may skate, you may walk, take train, tram, or bus,
Go in great state, or without any fuss,
You may bike on a wheel, a single or tandem,
Go just as you please, at will or at random,
You may stay at home near, or travel afar,
But nothing can equal a mote on a car.

The Steering of Automobiles

QUITE a number of accidents have happened recently, all of which seem to be more or less due to the steering mechanism of automobiles giving way. The accidents appear to have been confined to no particular type of car, and not in any special degree to any one system of steerage. The matter of providing an absolutely safe and sound means of effecting the required control has, throughout the development of the motor car, been felt to be one of the most difficult and urgent problems.

The substitution of wheel steering at sea by means of a worm and pinion in place of the direct action of a wheel or tiller, provides greater security against the risk of accidental deviation, at the expense of less sensitiveness of control and a lack of "sweetness" in executing delicate and rapid manœuvres. In the same degree the abandonment of the pivoted axle of a motor car in favor of the two separate and intercepted axles now usually adopted, while tending to abolish the liability of the axle to swing round bodily when one wheel encounters an obstacle, presents new mechanical problems, owing to the relative inherent weakness of the intercepting system. Again, an increase in the size of the parts which specially require strengthening leads to a corresponding augmentation of weight, to a greater amount of frictional resistance, and to other drawbacks. The whole question, indeed, bristles with fine points. A split-pin gives way, therefore let us do away with split pins. As an alternative cause of mishap a nut unscrews, or strips its thread, therefore nuts must be abandoned.

There can be no doubt that a distinct room for improvement exists in well-nigh all the steering mechanisms so far adopted in the automobile industry, and the necessity for practical perfection in this particular direction scarcely needs emphasizing. Under proper control, with all its working parts in good order, the automobile is distinctly the most manageable vehicle to be met with on common roads, and to the result the efficiency of its steerage most materially contributes. But with a defective steering gear it at once becomes the most dangerous user of the highway.

"Automobile Topics" is the name of a new illustrated weekly devoted to the doings of automobilists. The number before us contains 26 reading pages. The topics are presented in an interesting style. A schedule of coming events is included and there is a department devoted to what is going on at the leading theatres in the city. It is published in the Park Row Building and is edited by E. E. Schwarzkopf, formerly connected with this publication.

Comparative Tests of Electric Automobiles for City Service

PART II.

The average power consumption of vehicle *A* from Table II. for a complete circle of the park, going north on Fifth avenue, was 90.52 watt-hours per ton mile. The average power consumption going north on Eighth avenue was 90.99 watt-hours per ton mile. Taking the average of these, we find 90.75 watt-hours per ton mile to have been required for the propulsion of vehicle *A* over good asphalt pavement—with the exception of about .4 of a mile of bad cobble and macadam. Therefore, 90 watt-hours per ton mile may be taken as possible under ordinary conditions for vehicle *A* on level asphalt in good condition. This for an average speed of 9.71 miles per hour.

Having now seen what vehicle *A* was able to do under ordinary circumstances, it becomes of interest to know whether the results obtained were exceptional in any way, or whether they may be taken as representative of what may be required of electric vehicles in general under similar circumstances.

To determine this point, a number of vehicles of several other makes were tested over the same ground as vehicle *A,* under exactly similar conditions. In Table III. the results obtained while testing vehicle *B* are recorded. This vehicle was an electric delivery wagon designed for use in the same class of light delivery service as was vehicle *A*.

TABLE III.

[*Vehicle B.*]

Weight of vehicle	3,380 lbs.
Weight of passengers and instruments	334 lbs.
Weight of load carried	... ..
Total weight causing drawbar pull on test	3,714 lbs.
Battery equipment	40 cells
Weight of battery	1,250 lbs.
Per cent. of battery weight to total weight of vehicle	36.98 per cent.
Per cent. of battery weight to total weight causing drawbar pull	33.65 per cent.

Weather clear; no wind. Streets in good condition.

Principal ground covered on test: Fifth avenue, from Fifty-ninth street to One Hundred and Eleventh street; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Tenth street, from Fifth avenue to Eighth avenue; One Hundred and Eleventh street, from Fifth avenue to Eighth avenue; Eighth avenue, from Fifty-ninth to One Hundred and Eleventh street.

Total distance covered during test	26.19 miles
Total time in motion	2 hr. 39 min. 30 sec.
Average speed while in motion	9.85 miles per hr.
Total watt-hours used on trip	3,808
Average watt-hours used per car-mile	145.4
Average watt-hours used per ton-mile	78.29
For a distance of	0.85 mile
Time in motion was	6 min.
Average speed while in motion	8.5 miles per hr.
Number of watt-hours used	129.6
Average watt-hours used per car-mile	152.47
Average watt-hours used per ton-mile	82.1

For a distance of	2.61 miles
Time in motion was	14 min.
Average speed while in motion	11.18 miles per hr.
Number of watt-hours used	396.8
Average watt-hours used per car-mile	152 03
Average watt-hours used per ton-mile	81.87

For a distance of	0.52 mile
Time in motion was	3 min. 30 sec.
Average speed while in motion	8.91 miles per hr.
Number of watt-hours used	19.2
Average watt-hours used per car-mile	38.85
Average watt-hours used per ton-mile	20.72

For a distance of	2.54 miles
Time in motion was	14 min.
Average speed while in motion	10.88 miles per hr.
Number of watt-hours used	432
Average watt-hours used per car-mile	170 08
Average watt-hours used per ton-mile	91.58

For a distance of	0.6 mile
Time in motion was	4 min.
Average speed while in motion	9 miles per hr.
Number of watt-hours used	129.6
Average watt-hours used per car-mile	216
Average watt-hours used per ton-mile	116.31

For a distance of	2.61 miles
Time in motion was	15 min. 30 sec.
Average speed while in motion	10.1 miles per hr.
Number of watt-hours used	356.8
Average watt-hours used per car-mile	136.66
Average watt-hours used per ton mile	73.59

For a distance of	0.87 mile
Time in motion was	5 min. 30 sec.
Average speed while in motion	9.5 miles per hr.
Number of watt-hours used	86.4
Average watt-hours used per car-mile	99 31
Average watt-hours used per ton-mile	53.48

For a distance of	2.63 miles
Time in motion was	15 min. 30 sec.
Average speed while in motion	10.18 miles per hr.
Number of watt-hours used	404.8
Average watt-hours used per car-mile	153.91
Average watt-hours used per ton-mile	82.88

Tests of Electric Automobiles for City Service

For a distance of	2.64 miles
Time in motion was	14 min.
Average speed while in motion	11.31 miles per hr.
Number of watt-hours used	342.4
Average watt-hours used per car-mile	129.69
Average watt-hours used per ton-mile	69.83

For a distance of	0.62 mile
Time in motion was	5 min. 30 sec.
Average speed while in motion	6.76 miles per hr.
Number of watt-hours used	145.6
Average watt-hours used per car-mile	234.83
Average watt-hours used per ton-mile	126.45

For a distance of	2.55 miles
Time in motion was	17 min.
Average speed while in motion	9 miles per hr.
Number of watt-hours used	396.8
Average watt-hours used per car-mile	155.6
Average watt-hours used per ton-mile	83.79

For a distance of	0.64 mile
Time in motion was	4 min.
Average speed while in motion	9.6 miles per hr.
Number of watt-hours used	57.6
Average watt-hours used per car-mile	0
Average watt-hours used per ton mile	48.46

For a distance of	2 63 miles
Time in motion was	15 min.
Average speed while in motion	10.52 miles per hr.
Number of watt-hours used	336
Average watt-hours used per car-mile	127.75
Average watt-hours used per ton-mile	68.79

For a distance of	0.6 mile
Time in motion was	5 min. 30 sec.
Average speed while in motion	6.54 miles per hr.
Number of watt-hours used	144
Average watt-hours used per car-mile	240
Average watt-hours used per ton-mile	129.24

For a distance of	2.65 miles
Time in motion was	16 min.
Average speed while in motion	9.93 miles per hr.
Number of watt-hours used	368
Average watt-hours used per car-mile	138.86
Average watt-hours used per ton-mile	74.77

For a distance of	0.63 mile
Time in motion was	4 min. 30 sec.
Average speed while in motion	8.4 miles per hr.
Number of watt-hours used	62.4
Average watt-hours used per car mile	99.04
Average watt-hours used per ton-mile	53.33

Open circuit voltage at beginning of run	85 volts
Open circuit voltage at end of run	77.5 volts
Drop in 26.19 miles	7.5 volts
Running voltage at beginning of run	76 volts
Running voltage at end of run	66.5 volts
Drop in 26.19 miles	9.5 volts

From Table III. it will be noted that vehicle *B* covered 26.19 miles with an average rate of power consumption of 78.29 watt-hours per ton mile. The average speed was 9.85 miles per hour. The open circuit voltage at the end of the run was 1.93 volts per cell, and the running voltage was 1.66 volts. The maximum rate of power consumption noted was 129.24 watt-hours per ton mile. This rate of power consumption was recorded on a run of .6 of a mile, from Fifth avenue and One Hundred and Eleventh street to Eighth avenue and One Hundred and Tenth street. This particular part of the ground covered on this test included bad cobble pavement, a small grade and some bad macadam road surface. The speed on this section was only 6.54 miles per hour.

For the same section on another trip in the same direction, vehicle *B* showed a rate of power consumption of 126.45 watt-hours per ton mile at a speed of 6.76 miles per hour, which is at practically the same rate; and the results confirm the accuracy of those first obtained.

Over 24.5 miles of this run was around Central Park. Table IV. gives the result of two complete circles around the park in opposite directions.

TABLE IV.

[*Vehicle B.*]

Once around Central Park—North on Fifth avenue, south on Eighth avenue.

For a distance of	6.45 miles
Time in motion was	40 min. 30 sec.
Average speed while in motion	9.55 miles per hr.
Number of watt-hours used	942.4
Average watt-hours used per car mile	146.1
Average watt-hours used per ton-mile	78.62

Once around Central Park—North on Eighth avenue, south on Fifth avenue.

For a distance of	6.27 miles
Time in motion was	35 min. 30 sec.
Average speed while in motion	10.59 miles per hr.
Number of watt-hours used	977.6
Average watt-hours used per car-mile	155.91
Average watt-hours used per ton-mile	83.95

The discrepancy in distance that will be noted between the trip of vehicle *B* around the park, going north on Fifth avenue, and for the same trip as noted in Table II. for vehicle *A,* is due to the fact that vehicle *B* on this trip went through One Hundred and Eleventh street, instead of One Hundred and Tenth street.

The average of the two circles around the park noted in Table IV. gives 81.28 as the average rate of power consumption required to propel vehicle *B* around the park on good pavement—with the exception of the .6 of a mile of bad road surface noted above. So it is thought 80 watt-hours per ton mile may be taken as a possible rate of power consumption for vehicle *B* on level asphalt in good condition for an average speed of 10 miles per hour.

A comparison of the results obtained from Tables II. and IV. shows that vehicle *A* required 90 watt-hours per ton mile to propel it on level asphalt, while vehicle *B* required but 80. Hence it would seem as though the results obtained while testing vehicle *A* are in no way exceptional, and may be taken as representative of what may be expected of well-designed electric vehicles in general under similar circumstances.

Both vehicles *A* and *B* were equipped with solid rubber tires, and the ratio of the weights of their batteries and passengers to the weights of the vehicles as units was practically the same. The wheels of each vehicle were equipped with ball-bearings. The armature shaft on vehicle *B* was also equipped with ball-bearings. This was not the case with vehicle *A,* which would seem to indicate, as might be expected, that there is a saving in power consumption where ball-bearings or other friction reducing devices are used at all possible points.

A TEST WITHOUT FRICTION-REDUCING DEVICES.

That this is the case, the results presented in Table V. seem to confirm. In this table the results obtained while testing a vehicle designed for use in the same class of light delivery service as vehicles *A* and *B* are given. This vehicle was equipped with solid rubber tires, as were the others; but, unlike them, it had no ball-bearings or other friction reducing equipment at all—the wheels and motor shafts running in plain bearings.

TABLE V.

[*Vehicle C.*]

Weight of vehicle	4,190 lbs.
Weight of passengers and instruments	335 lbs.
Weight of load carried	...
Total weight causing drawbar pull on test	4,525 lbs.

Battery equipment .... 44 cells
Weight of battery.. ....1,200 lbs.
Per cent. of battery weight to total weight of vehicle ....28.63 per cent.
Per cent. of battery weight to total weight causing drawbar pull........26.51 per cent.

Principal ground covered on test: Fifth avenue, from Twentieth street to One Hundred and Eleventh street; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Eleventh street, from Fifth avenue to Eighth avenue; Eighth avenue, from Fifty-ninth street to One Hundred and Eleventh street; Twenty-first street, from Seventh avenue to Fifth avenue.

Total distance covered during test...................................24.75 miles
Total time in motion ....2 hr. 47 min. 54 sec.
Average speed while in motion.............................. 8.83 miles per hr.
Total watt-hours used...5,316.8
Average watt-hours used per car-mile...................................... 214.82
Average watt-hours used per ton-mile....................................... 94.92

For a distance of...2.38 miles
Time in motion was ....18 min. 54 sec.
Average speed while in motion................................7.55 miles per hr.
Number of watt-hours used 561.6
Average watt-hours used per car-mile...................................235.96
Average watt-hours used per ton-mile...................................104.22

For a distance of..2.62 miles
Time in motion was...15 min. 30 sec.
Average speed while in motion................................10.14 miles per hr.
Number of watt-hours used...494.4
Average watt-hours used per car-mile...................................188.7
Average watt-hours used per ton-mile...................................83.11

For distance of ....0.55 miles.
Time in motion was...5 min.
Average speed while in motion................................6.66 miles per hr.
Number of watt hours used.. 220.8
Average watt-hours used per car-mile.................................. 401.45
Average watt-hours used per ton-mile...................................177.39

For a distance of..2.6 miles
Time in motion was...17 min.
Average speed while in motion ....9.17 miles per hr.
Number of watts-hours used 579.2
Average watt-hours used per car-mile...................................222.77
Average watt-hours used per ton-mile...................................98.44

For a distance of..0.63 mile
Time in motion was...3 min. 30 sec.
Average speed while in motion................................10.8 miles per hr.
Number of watt-hours used.. 80
Average watt-hours used per car-mile...................................127
Average watt-hours used per ton-mile 56.12

For a distance of..0.68 mile
Time in motion was ....4 min. 45 sec.
Average speed while in motion ....8.58 miles per hr.
Number of watt-hours used...200
Average watt-hours used per car-mile...................................294.11
Average watt-hours used per ton-mile...................................129.96

Tests of Electric Automobiles for City Service

For a distance of	2.61 miles
Time in motion was	15 min. 45 sec.
Average speed while in motion	9.94 miles per hr.
Number of watt-hours used	472
Average watt-hours used per car-mile	180.84
Average watt-hours used per ton-mile	79.91

For a distance of	0.58 mile
Time in motion was	4 min. 30 sec.
Average speed while in motion	7.73 miles per hr.
Number of watt-hours used	97.6
Average watt-hours used per car-mile	168.27
Average watt-hours used per ton-mile	74.35

For a distance of	2.57 miles
Time in motion was	16 min. 30 sec.
Average speed while in motion	9.34 miles per hr.
Number of watt-hours used	588.8
Average watt-hours used per car-mile	229.1
Average watt-hours used per ton-mile	101.23

For a distance of	2.67 miles
Time in motion was	15 min.
Average speed while in motion	10.68 miles per hr.
Number of watt-hours used	489.6
Average watt-hours used per car-mile	183.37
Average watt-hours used per ton-mile	81.02

For a distance of	0.61 mile
Time in motion was	5 min.
Average speed while in motion	7.32 miles per hr.
Number of watt-hours used	216
Average watt-hours used per car-mile	354.09
Average watt-hours used per ton-mile	156.46

For a distance of	2.55 miles
Time in motion was	18 min.
Average speed while in motion	8.5 miles per hr.
Number of watt-hours used	576
Average watt-hours used per car-mile	225.88
Average watt-hours used per ton-mile	99.81

For a distance of	3.7 miles
Time in motion was	28 min. 30 sec.
Average speed while in motion	7.78 miles per hr.
Number of watt-hours used	740.8
Average watt-hours used per car-mile	200.21
Average watt-hours used per ton-mile	88.47
Open circuit voltage at beginning of run	90 volts
Open circuit voltage at end of run	84 volts
Drop in 24.75 miles	6 volts
Running voltage at beginning of run	85 volts
Running voltage at end of run	78 volts
Drop in 24.75 miles	7 volts

Vehicle *C*, therefore, from Table V., traveled 24.75 miles with an average rate of power consumption of 94.92 watt-hours per ton mile at an average speed of 8.83 miles per hour. The open circuit voltage at the end of the run was over 1.9 volts per cell, and the running voltage over 1.77 volts per cell. The maximum rate of power consumption was recorded over the .6 of a mile of bad cobble and macadam in One Hundred and Eleventh street, as was the case in the test on Vehicle *B*. This maximum was 177.39 watt-hours per ton mile. It is 20.93 watt-hours higher than the 156.46 watt-hours per ton mile rate noted for this vehicle over the same ground in the same direction at another time. The latter rate was obtained while traveling under more normal conditions, and it is thought is more accurate.

Over 18 miles of this test was around the park, and Table VI. shows the results of two complete circles of it.

TABLE VI.

[*Vehicle C.*]

Once around Central Park—North on Fifth Avenue, south on Eighth Avenue.

For a distance of	6.4 miles
Time in motion was	.41 min.
Average speed while in motion	9.36 miles per hr.
Number of watt-hours used	1,374.4
Average watt-hours used per car-mile	214.75
Average watt-hours used per ton-mile	95.02

Once around Central Park—North on Eighth Avenue, south on Fifth Avenue.

For a distance of	6.44 miles
Time in motion was	40 min. 50 sec.
Average speed while in motion	9.46 miles per hr.
Number of watt-hours used	1,358.4
Average watt-hours used per car-mile	214.03
Average watt-hours used per ton-mile	94.7

From Table VI. the average of the two trips around the park shows a rate of power consumption of practically 95 watt-hours per ton mile for level asphalt, as against 90 watt-hours per ton mile for vehicle *A*, and 80 watt-hours per ton mile for vehicle *B*. This bears out conclusively the contention that it is necessary to use friction-reducing mechanisms at all possible points in order to get the lowest rate of power consumption.

Some manufacturers, however, consider that the saving in power consumption thus effected is offset by the disadvantages which arise from the use of the increased number of parts required

and the greater liability of the mechanism to get out of order; thus causing a higher rate of depreciation and increasing the initial cost as well as the cost of repairs. Another disadvantage arising from this complication of parts, it is contended, is that the time and labor required to keep the vehicle in proper running order is much greater than when the simpler mechanism is employed.

THE ADVANTAGES OF A LIGHT VEHICLE.

In Tables I., III. and V. it will be noted that the average watt-hours used per car mile were, respectively, 155.27 watt-hours, 145.4 watt-hours and 214.82 watt-hours, which clearly indicate the advantage of a light vehicle from the point of view of its rate of power consumption. As these vehicles were all designed to carry practically the same load, it follows that so far as operating expenses are concerned, the lighter vehicles are better adapted to the service required of them.

So far the tests considered were made on vehicles that carried no load except that caused by two passengers and the instruments used for testing purposes. The question which suggests itself in this connection is, Will the addition of a "load" in any way affect conclusions based on results obtained while testing vehicles without loads?

To determine this important point, vehicle *A* was loaded and a test was made which covered part of the same ground covered on other tests with vehicle *A* unloaded under identical conditions. Table VII. gives the results obtained on this run.

TABLE VII.

[*Vehicle A.*]

Weight of vehicle	3,085 lbs.
Weight of passengers and instruments	305 lbs.
Weight of load carried	625 lbs.
Total weight causing drawbar pull on test	4,015 lbs.
Per cent. of battery weight to total weight of vehicle	36.3%
Per cent. of battery weight to total weight causing drawbar pull	27.89%

Principal ground covered on test: Fifth avenue, from Fifty-ninth street to One Hundred and Tenth street; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Tenth street, from Fifth avenue to Eighth avenue; Eighth avenue, from Twentieth street to One Hundred and Tenth street; Twenty-first street, from Seventh avenue to Eighth avenue; Broadway, from Forty-second street to One Hundred and Twentieth street.

Total distance covered on test	1.744 miles
Total time in motion	1 hr. 59 min. 55 sec.
Average speed while in motion	8.72 miles per hr.
Total watt-hours used on trip	3,249.6
Average watt-hours used per car-mile	186.33
Average watt-hours used per ton-mile	92.81

For a distance of	1.23 miles
Time in motion was	11 min. 30 sec.
Average speed while in motion	6.41 miles per hr.
Number of watt-hours used	203.2
Average watt-hours used per car-mile	165.2
Average watt-hours used per ton-mile	82.29

For a distance of	2.7 miles
Time in motion was	21 min. 30 sec.
Average speed while in motion	7.53 miles per hr.
Number of watt-hours used	534.4
Average watt-hours used per car-mile	197.92
Average watt-hours used per ton-mile	98.59

For a distance of	2.57 miles
Time in motion was	16 min. 20 sec.
Average speed while in motion	9.44 miles per hr.
Number of watt-hours used	414.4
Average watt-hours used per car-mile	161.24
Average watt-hours used per ton-mile	80.31

For a distance of	0.53 mile
Time in motion was	4 min. 30 sec.
Average speed while in motion	7.06 miles per hr.
Number of watt-hours used	158.4
Average watt-hours used per car-mile	298.86
Average watt-hours used per ton-mile	148.87

For a distance of	2.61 miles
Time in motion was	18 min.
Average speed while in motion	8.7 miles per hr.
Number of watt-hours used	544
Average watt-hours used per car-mile	208.42
Average watt-hours used per ton-mile	103.82

For a distance of	3.32 miles
Time in motion was	22 min. 5 sec.
Average speed while in motion	9.02 miles per hr.
Number of watt-hours used	657.6
Average watt-hours used per car-mile	198.07
Average watt-hours used per ton-mile	98.66

For a distance of	4.48 miles
Time in motion was	26 min.
Average speed while in motion	10.33 miles per hr.
Number of watt-hours used	737.6
Average watt-hours used per car-mile	164.64
Average watt-hours used per ton-mile	82.01

Open circuit voltage at beginning of run	97 volts
Open circuit voltage at end of run	92 volts
Drop in 17.44 miles	5 volts

Runnning voltage at beginning of run	91 volts
Running voltage at end of run	86 volts
Drop in 17.44 miles	5 volts

From Table VII. it will be seen that the watt-hours per ton mile required by vehicle A remained practically the same, whether it was loaded or not. Therefore, all conclusions based on tests on unloaded vehicles, it would seem, hold true when considering vehicles carrying a load.

From Table I. the average watt-hours per ton mile required by vehicle *A* to cover a distance of 31.51 miles were 91.6. From Table VII. the average watt-hours per ton mile for 17.44 miles required by vehicle *A*, with a load, were 92.81, practically identical results, as the run of Table VII. included a little more hill work than that of Table I., which accounts for the difference shown.

Comparing the results obtained while traveling over the same ground with vehicle *A* loaded and unloaded, it is found that the watt-hours per ton mile for the average of two runs over the same ground unloaded give 80.27 watt-hours per ton mile at a speed of 10 miles per hour, while the watt-hours per ton mile for the vehicle with a load were 80.31 at a speed of 9.44 miles per hour—a closer agreement even than was noted above. The average watt-hours per car mile for this section of the unloaded run were 136.12; for the same section of the loaded run, 161.24.

It will be noticed in Table VII. that though the average watt-hours used per car mile by vehicle *A* while carrying a load were 186.33, this rate is still not as high as that shown in Table V. for vehicle *C* without a load, which emphasizes the point already referred to, that for the same class of service, from a commercial point of view, the lighter vehicle is better adapted to its work.

So far all the vehicles considered were equipped with solid rubber tires. To determine if any considerable difference in power consumption results when pneumatic tires are used, vehicle *A* was equipped with wheels on which were 4-inch pneumatic tires. These replaced front wheels on which were 2-inch solid rubber tires, and back wheels on which the solid tires were 2.5 inches. Table VIII. gives the result of this test.

TABLE VIII.

[*Vehicle A.*]

Weight of vehicle	3,050 lbs.
Weight of passengers and instruments	305 lbs.
Weight of load carried	....
Total weight causing drawbar pull on test	3,355 lbs.

Per cent. of battery weight to total weight of vehicle	36.72 %
Per cent. of battery weight to total weight causing drawbar pull	33.38 %

Principal ground covered on test: Fifth avenue, from Forty-second street to One Hundred and Tenth street; One Hundred and Tenth street, from Fifth avenue to Seventh avenue; Eighth avenue, from Forty-second street to One Hundred and Forty-ninth street; Seventh avenue, from One Hundred and Tenth street to One Hundred and Fifty-fourth street; Macomb's lane, from One Hundred and Fifty-fourth street to One Hundred and Forty-ninth street.

Total distance covered during test	12.85 miles
Total time in motion	1 hr. 21 min. 45 sec.
Average speed while in motion	9.43 miles per hr.
Total watt-hours used on trip	2,252.8
Average watt-hours used per car-mile	175.32
Average watt-hours used per ton-mile	104.51

For a distance of	1.43 miles
Time in motion was	9 min. 30 sec.
Average speed while in motion	9.03 miles per hr.
Number of watt-hours used	246.4
Average watt-hours used per car-mile	172.3
Average watt-hours used per ton-mile	102.71

For a distance of	2.56 miles
Time in motion was	15 min.
Average speed while in motion	10.24 miles per hr.
Number of watt-hours used	384
Average watt-hours used per car-mile	150
Average watt-hours used per ton-mile	89.42

For a distance of	0.4 mile
Time in motion was	4 min.
Average speed while in motion	6 miles per hr.
Number of watt-hours used	91.2
Average watt-hours used per car-mile	228
Average watt-hours used per ton-mile	135.91

For a distance of	2.04 miles
Time in motion was	13 min.
Average speed while in motion	9.42 miles per hr.
Number of watt-hours used	396.8
Average watt-hours used per car-mile	194.5
Average watt-hours used per ton-mile	115.94

For a distance of	2.5 miles
Time in motion was	15 min. 30 sec.
Average speed while in motion	9.67 miles per hr.
Number of watt-hours used	608
Average watt-hours used per car-mile	243.2
Average watt-hours used per ton-mile	144.98

For a distance of	2.56 miles
Time in motion was	15 min. 30 sec.

Average speed while in motion	9.9 miles per hr.
Number of watt-hours used	310.4
Average watt-hours used per car-mile	121.25
Average watt-hours used per ton-mile	72.28

For a distance of	1.36 miles
Time in motion was	9 min. 15 sec.
Average speed while in motion	8.82 miles per hr.
Number of watt-hours used	216
Average watt-hours used per car-mile	158.82
Average watt-hours used per ton-mile	94.67
Open circuit voltage at beninning of run	98.5 volts
Open circuit voltage at end of run	94 volts
Drop in 12.85 miles	4.5 volts
Running voltage at beginning of run	90 volts
Running voltage at end of run	89 volts
Drop in 12.85 miles	1 volt

From Table VIII. it will be seen that the average watt-hours per ton mile were 104.51 for vehicle *A* with pneumatic tires on for a distance of 12.85 miles. This is a much higher rate of power consumption than was required by this vehicle with solid tires on. Owing to the nature of some of the ground covered on this trip, the result noted above cannot be used for direct comparison. Part of this test, however, was over the same ground previously covered by the vehicle under identical conditions, with the exception that solid tires were used. A comparison of the results obtained while traveling over this ground, first with solid tires and then with pneumatics, gives the rate of power consumption for solid tires as 80.27 watt-hours per ton mile, as against 89.42 watt-hours per ton mile with pneumatics, at practically the same speed.

It may be assumed, therefore, that vehicles equipped with pneumatic tires will show a slightly increased rate of power consumption over those equipped with solid tires.

Part of the test recorded in Table VIII. was over a macadam road surface, and the rate of power consumption while traveling over this section of the route was 115.94 watt-hours per ton mile.

For a distance of 2.5 miles, which included some macadam road surface, cobbles, a sandy stretch of road, a slight grade and some asphalt, the average rate of power consumption noted was 144.98 watt-hours per ton mile, and for a distance of .4 of a mile over cobbles and bad macadam the rate of power consumption was 135.91 watt-hours per ton mile. This accounts, in some measure, for the high average rate of power consumption recorded for the trip. Even with such a high rate of power consumption,

however, as is shown for nearly half the distance covered, the total average watt-hours used per car mile were only 104.51.

All the tests noted to this point were made under ideal weather conditions, and the greater part of each run was over good asphalt pavement. Therefore, the results so far may be looked upon as representing the best that can be expected of electric vehicles under ordinary commercial conditions in New York City to-day at this present early stage in their development."

Pistcn, rod and crank shaft power loss, 25 per cent.; belt transmission from motor shaft to speed shaft, loss say 10 per cent.; toothed gearing from speed shaft to sprocket shaft, loss 10 per cent.; sprocket and chain transmission from sprocket shaft to driving wheels, 10 per cent. loss by friction.

Say, as before, that ¾ of 1 horse-power effect is required on the drivers, then the sprocket shaft must be supplied with 0.825 horse-power, the counter-shaft with 0.9 horse-power; the crank-shaft must deliver 1 horse-power to the counter-shaft belt, and the cylinder and piston must generate 1¼ horse-power to exert a ¾ horse-power wagon driving effect between the driving wheels and the road surface, as against 0.825 horse-power in the first example. This means, in plain English, that the wagon having the ordinary elements of power transmission with sliding bearing surfaces must have a motor considerably more than one-third more powerful than it needs to be, and must consume more than one-third more fuel per mile of travel than is needful, thus making more weight and running cost, and demanding more attention from the driver, more cost for repairs, and more work on the wheel tires by more than one-third than is needful, useful or desirable. The wagon must be heavier than it needs to be, and for every pound the constructor adds to the wagon weight he must add a certain other increment of wagon framing weight to carry that added pound in safety. Lumping all these things together and speaking in round terms, it is perfectly safe to say that all the French, German and English wagons now made weigh from one-half more than would be needful if they were made with the best possible bearings to double the smallest safe weight, and so demand from six to twelve times as large a motor to meet all the varying conditions of road wagon propulsion as is utilized in the case of the lightest safe wagon fitted with the best possible bearings on a good level road. From 3½ to 6 brake horse-power must be delivered by the crank-shaft to the power transmission elements of the wagon carrying two passengers, carrying from seven to ten times the fuel actually needful and requiring vastly more attention from the driver and vastly more repairs than the lighter wagon with the best possible bearings.

From this standpoint of view the all-overshadowing importance of the bearing becomes plainly apparent, and it seems very clear that the first requirement of a satisfactory automobile is permanent bearings, operating with the least friction possible with commercially practicable elements.

This conclusion in regard to bearings is not generally accepted as correct by automobile constructors. Panhard and Levassor, the celebrated French automobile constructors, made elaborate experiments with ball bearings under working conditions and arrived at the conclusion that ball bearings gave no gain whatever at high speeds, and only half of one per cent. gain at low speeds, and also announced in general terms that the frictional resistance of the wagon bearings formed only a very small part of the total resistance to wagon propulsion and ball bearings for wagon, motor and transmission parts are almost universally regarded as unsuitable for all wagon use, except in vehicles of the very lightest description.

Certainly no rider would use a bicycle without ball bearings, and our light American steam-driven wagons which may be regarded as having more nearly reached a standard form than any other mechanically driven vehicle made, use ball bearings in the road wheels, for the balance gear, for the crank-shaft and for the crank ends of the connecting rods.

Undoubtedly the experiments of Panhard and Levassor were made with faulty forms of ball bearings.

In a subsequent issue of the *Electrical World and Engineer* Mr. Fliess contributes a second article, in which he shows what electric motor vehicles may be expected to do when encountering adverse conditions. From the data which is given in the two articles it was shown that for light delivery service electric vehicles may reasonably be expected to travel 22 miles on one charge of battery at an average speed of 8.5 miles per hour under ordinary service conditions when carrying a load usually placed on vehicles in this class of service. It is also demonstrated by the articles referred to that they can be expected to do this with an average rate of power consumption seldom exceeding 115 watt-hours per ton mile and an average battery efficiency not often less than 70 per cent. of the running voltage is not often allowed to drop below 1.75 volts per cell on a trip—this when the carriage is fitted with rubber tires.

In a third article the author goes into the relative cost of horse-drawn and electric vehicles, in which he shows that mechanical transportation on common roads will become more advantageous as the condition of roads improves and the average speed of traffic on city streets has been raised.

The Gradometer

VERY few automobile or cycle riders have an accurate idea of the grade per cent. they can climb. If their machines ascend easily, they are apt to underrate the grade per cent.; while, on the other hand, if it is hard work to get up, they are apt to greatly overrate the grade per cent. The grade that an automobile will climb has been as much overrated by manufacturers and users as has the horse-power that the motor would develop. There has been no convenient instrument with which to measure the grade. Pendulums with a graduated circle have been tried, and they answered fairly well when at rest, but beside being very bulky they were entirely unreliable when attached to

a vehicle under motion. The vibration would cause the pendulum to swing back and forth so readings could not be taken. The Adams Company, of Dubuque, Iowa, has just placed upon the market a very attractive little instrument that may be attached to the side of the seat of any vehicle or to the top tube of a bicycle, and the grade the vehicle is ascending or descending can be determined at a glance. Gradometer is the name given the instrument, and it consists of a nickel-plated casing, 6 inches long, containing a curved glass tube filled with spirits, leaving a small bubble, which acts the same as a spirit level. The casing has graduations on one side of the opening and figures from 0 to 30 each way from the centre on the other side, so the per cent. of grade can be read from the level to 30 per cent., either ascending or descending. The half tone shows a gradometer attached to the left side of a vehicle seat.

The Automobile as a Factor in the Construction of Good Roads

AS bearing upon the influence the more general introduction of the automobile will have upon good roads, we give extracts from an editorial which appeared in the New York *Tribune* of Sunday, November 4:

"Though general progress in the improvement of public highways is slow, it cannot be doubted that the cause of good roads is destined to prevail. Even if there were only a feeble indication here and there of interest in the subject, it would still be unreasonable to suppose that a thrifty and intelligent people would always remain indifferent. But in recent years there has been a notable awakening, which in some States has already produced actual results of great importance. In an address to which we lately referred President Mendenhall of the Worcester Polytechnic Institute, who is a member of the Highway Commission, describing what is being done in Massachusetts, said that during the last six or eight years more money had been spent there in road improvement than in any other State. The plan now in process of execution involves a reconstruction of the road system of the Commonwealth, embracing about 2,000 miles, or 10 per cent. of the whole, to which local effort will doubtless, in time, make large additions. An annual appropriation of $500,000 enables the Commission to complete about 50 miles every year, and it could probably obtain $1,000,000 from the Legislature if it so desired. Truly this is a wise liberality which may well cause envy in other parts of the country.

"We have frequently discussed this subject, but we find a new and particularly interesting suggestion in the fact that Dr. Mendenhall's address was delivered before the Automobile Club of America. The part which the bicycle has taken in the promotion of highway improvement is acknowledged to be important. Perhaps it might not be exaggeration to say that the influence exerted by wheelmen in support of that work has been stronger than that proceeding from any other source, and it now seems probable that the movement will be taken up by the owners of horseless vehicles with increasing earnestness as their number multiplies and their use extends. So long as, outside of centres of population, the automobile remains chiefly an instrument of pleasure it may not count for much in the demonstration of the

good roads proposition, and it is even possible that some persons will be so narrow minded as to listen with a trace of resentment to claims made in its behalf. But if such a feeling should develop it could not last long. There is reason to suppose that the automobile is destined to occupy a great place in the domestic economy of the civilized world. In proportion as it makes its way into the common service of the people by its adaptability to commercial and industrial uses, they will recognize the conditions which it peculiarly demands and consent to supply them.

"There are many indications that the automobile is on the eve of a general conquest comparable in extent with that which the bicycle so swiftly achieved and otherwise more important to mankind. The recent show in Madison Square Garden cannot fail to stimulate the growing interest that it illustrates. It attracted an immense number of visitors and will go on record as one of the great industrial displays with which that indispensable building is identified. And after it was over the impression remained in many minds that another powerful advocate of good roads had come into existence."

First Run of the Rhode Island Automobile Club

THE first club run of the Rhode Island Automobile Club was held October 22 and was a decided success. Carriages of all types—steam, gasoline and electric—were present. There were seventeen in line at the start. The run ended in a dinner at the Narragansett Hotel, at which a number of the members related their experiences.

Committeeman Lippitt spoke of the purposes of the club and the necessity, for organization, to secure headquarters, and for mutual protection against accidents. He spoke of the need of having a man experienced in the repair of electric, steam and gasoline machines available at all times, and of how easily, with a good membership, and sufficient dues, such a man could be secured to be at the service of all club members at all times without cost other than the club dues. He also referred to the necessity for organization to protect members against undue liability for accidents, and of the strength such an organization could add to the efforts now being made by the wheelmen and horsemen of this country in the cause of good roads.

First Run of the Rhode Island Automobile Club

Secretary Fletcher spoke of what the club could do for owners in holding gatherings, at which each might give his own experience for the benefit of the whole.

Mr. Mossberg spoke on the future of the automobile from the standard of a manufacturer. He said that while the limit of electric machines now seemed to be about 30 miles, he believed that the great advance in batteries within the last year would result in making the electric machine the best of all. He said he was now experimenting on a machine that would, he was convinced, go 60 miles without recharging. He believed there would be no trouble soon in finding charging stations, as with the advance of the automobile interest they would be established at all points.

President Chase said the gasoline machines had made great strides forward in the last few years, and were now, in his opinion, the most reliable. In France, where they are now four or five years ahead of this country, they are taking up electricity and working out its problem. The Tourists' Cycle Club of France, of which he had for years been a member, issued an automobile book in connection with its last bicycle road book, in which the location of all the charging stations was given. Batteries are daily being improved for adaptation to the automobile, he said.

Mr. Lippitt said he had been approached by owners of drug stores in nearby towns, who had offered to keep gasoline on hand at all times for the members of the club, on condition that they be posted as club stations.

The Rhode Island Automobile Club has been active for about two months, but was chartered several months before that time. It now has 24 members, 15 owning machines. About 20 applications have already been received, to be acted on at the next meeting, and arrangements are to be made, as soon as the growth of the club warrants, for a club-room and other conveniences.

When a man gets to the stage where he thinks the automobile is what he wants, he is confronted by several problems, the main one being, Which carriage shall I buy? He wants a machine that will require but little attention, that will be ready at all times, that will start when he desires and stop ditto, that will get him home without breaking down and not require a mechanic to operate it. The average man does not care for the details, and whether the cost of operation is one-half a cent a mile or two cents a mile isn't of great importance if the other requirements are fulfilled.

Automobiles—Pro and Con

By R. E. Marks

MOST people expect too much of an automobile. They seem to forget it's a machine and hasn't any brains, as a horse has, and will go into a stone wall or off the dock unless the driver stops it—a horse wouldn't. But just suppose the case of a man who had never seen a horse, except at a distance, and put him in a carriage with the reins in his hand. Tell him how to turn to the right and left, to stop, back, etc., and then let him go ahead. Is it likely he will get through a ride without numerous misgivings as to whether he will ever get home alive or not?

Then suppose the horse goes lame, he isn't likely to know whether it's a stone in his shoe or ordinary lameness, while any of the other ailments will be just as mysterious to him as motor diseases are to the average man.

As I said before, an automobile is a machine, and as any machine is practically certain to get out of order sooner or later—generally sooner—such occurrences should be expected and provided for. Learn the symptoms of the various diseases to which your particular motor is heir and to diagnose the case so as to determine whether it is appendicitis or convulsions. The maker should post you thoroughly on these possible happenings so you will be prepared for emergencies. I'm not trying to discourage anyone, far from it, for it's the greatest institution that has come in our day, but I want to prevent disappointment on the part of those who may fancy that an automobile never breaks down and that the motor always motes three hundred and sixty-seven days a year. I wish I knew how to make them so they would, but I don't. Still, they give one more pleasure than any other vehicle I know of.

Then there's the question of noise and odor which most manufacturers declare are entirely absent from their machines. But there isn't a machine that I know of using oil for fuel in any way that is entirely free from smells which we would rather do without. Some are worse than others, but the oil odor is there to more or less degree.

When, however, we consider the small amount as compared with the volume of air around us on a country road it isn't much of a question after all and one least to be considered.

Automobiles--Pro and Con

The noise phase of the question is largely one of education. We grow up with the beat of horses' hoofs in our ears and we become accustomed to it, although on hard macadam roads the noise is considerable. But the regular puff-puff of the motor's exhaust is different. Its extreme regularity and the sound being of a different nature makes it much more noticeable at first, when in reality it is often less than that of horses' hoofs.

But against its undesirable points we can set those which tell sq strongly in its favor, and its growth is sure to astonish those who are apt to look on it as a passing fad. It has come to stay, and I believe its advancement will be aided by admitting its defects and trying to remedy them.

An Encouraging Sign

THOSE of us who were pioneers in the days of bicycling remember the vials of wrath that were poured on us from all sides when we left the city behind and hied away where fields were green. The old plow jogger on the road was worse than the thoroughbred, and the farmers told us in all kinds of ways and with various adjectives that we were nuisances and " hadn't no business on the roads with them things, anyhow."

But the automobilist has an easier row to hoe, for the farmers are looking with more favor on the new vehicles and seem rather ashamed of their horses when they shy at the motor-driven carriage. They, too, are getting into line, as shown by the interest shown at various State fairs and similar agricultural events. It's an encouraging sign.

Unless the present restrictions regarding automobiles on ferry boats are removed, the isolation of the eastern states from the rest of the country is as secure as though a Chinese wall was in existence along the Hudson river. With not a bridge for carriages across the river below Albany the only alternative is to return to the idea of Oliver Evans and his vehicle of 1804. This he ran across the City of Philadelphia to the Schuykill river and fastening paddles on the wheels ran it in the river as a boat. There seems to be a market for something of the kind in New York at present, unless some enterprising ferryman establishes an automobile ferry at a fairly accessible point.

Run of the Automobile Club of New Jersey

THE Automobile Club of New Jersey had a run on election day from East Orange to Morristown, a distance of about 20 miles each way. This is a trip that tries the hill climbing capacity of a machine, for although the roads are fine there are several long hills which must be ascended.

The run was marred at the outset by an accident to Treasurer Whipple's locomobile, which was carrying four at the time. In

Ready for the Run

turning out for a team the machine slewed and one of the rear wheels went to pieces. One of the occupants was thrown, hurting his knee quite badly, while those on the rear seat made hurried dismounts that were probably better examples of celerity than grace.

With this exception, however, the run was enjoyed by all participants and the return made in good time. The club is growing slowly, but surely, and bids fair to become quite a factor in the field. Just before starting they assembled on Mr. Scarritt's lawn, where the group picture was taken.

Celerior

The shades of night were falling fast,
As through a country village passed
A youth who drove through mist and storm
A motor-car of Daimler form.
Celerior.*

His brow was scored, his eye was bright,
His lamps shone forth their dazzling light,
While like a siren in a storm
Blared out the well-known motor horn.
Celerior.

By happy homes both warm and snug,
He wildly plied his sparking plug.
When right in front a helmet shone,
And from his lips escaped a groan.
Celerior.

"Too fast! Too fast!" the policeman cried,
And as the car his truncheon shied;
But speeding on like startled bird,
A loud and clarion voice was heard,
Celerior.

"O stay," the hostess said, "and rest,
Of all the inns this is the best."
He brushed a tear from off his eye,
And answered straight without a sigh,
"Celerior."

"Beware the newly metalled road.
Beware the drunken carter's load,"
This was the hostess's last "adieu,"
As car and driver fled from view.
Celerior.

Some laborers at break of day,
To work proceeding on their way,
Of something strange became aware,
Such scent of gasoline filled the air.
Celerior.

'Midst fragments scattered all around,
A motor man lay on the ground,
Still grasping in his hand of ice
The lever marked with plain device,
"Celerior."

There in the twilight cold and grey
Lifeless and scotched at last he lay,
While from the crowd which gathered round,
A voice fell solemnly profound.
"Celerime.†"

(T. FRED. HUNT, in *Motor Car Journal*. After Longfellow—a long way after.)

*Celerior = Faster.
†Celerime = Too fast.

An application was filed November 1 in Common Pleas Court No. 4, Philadelphia, asking for a charter for "The Pennsylvania Automobile Club." The main purpose of the organization, as set forth in the application, is the "encouraging and promotion of automobiling and the cultivation of the study of machinery used in motor vehicles among the members and others; increasing proficiency in operating the same; encouraging the betterment and improving of public roads and highways; fostering a general interest in automobiles and for promoting social intercourse among its members and the maintenance of a club-house."

The incorporators are F. L. Sweany, D. W. Webster, Charles S. King, of Camden; Henry J. Johnson, William F. Rudolph, Charles E. Wright, Robert P. McCurdy, L. Goodman, George E. Gossler, S. R. Weaver, J. K. Wharton, Julian Haugwitz, Edwin M. Rosenbluth, Benjamin F. Buzby, of Swedesboro, N. J.; T. C. Palmer and Charles L. Klauder. The officers are as follows: President, F. L. Sweany; First Vice-President, Julian Haugwitz; Second Vice-President, Charles L. Klauder; Secretary, Henry J. Johnson; Treasurer, Charles E. Wright; Directors, in addition to the above, Robert P. McCurdy, William F. Rudolph, D. W. Webster, Charles S. King and George E. Gossler.

It is stated that an automobile accident insurance association is about to be formed in New York City. Its objects will be to insure its policy holders against accidents and to defend the innumerable law-suits which have been brought against motorists all over the country, often on very slight provocation.

Correspondence

(Desiring to make this department of real value, we invite contributions from men who are interested in both the construction and operation of automobiles.)

A PUZZLED PURCHASER

I want an automobile, but the kind to buy is puzzling me just as the question of bicycle did a few years—only this seems worse. Being somewhat familiar with steam engines makes me lean a little that way, but it's nip and tuck between steam and gasoline with me now. Electrics are fine, but out of the question for suburbanites at present, and I want at least a 50 mile range of action—rather have 75, as I'm rather a long-distance man. It seems to sum up about as follows:

Steam means a boiler with a flame under it and an engine. The boiler requires a feed pump and a fuel regulator, so that the operator must watch the water glass, must regulate his fuel, keep his eye on the steam gauge and see that his oil and water tanks don't run dry. The engine itself is easy to regulate and run.

The gasoline machine uses the fuel direct in the engine, but requires water for cooling the cylinders, so there are two tanks to look after just the same, but the water doesn't need much attention, as very little evaporates. But while there isn't so much to watch in the way of gauges, there is the fuel feed, the spark regulator and the high and low speed clutches. Then there is something a little mysterious about the gasoline engine to the man who is familiar with steam, and he doesn't quite understand the "why" of the carbureter, the spark plugs and their batteries and some other points. I like the idea of getting down to first principles and using the fuel direct in the engine, but I'm not sure which type of machine I want to run regularly.

R. E. M.

New York.

DELIGHTS OF THE AUTOMOBILE

It is a curious fact that the newest things are not new—which is essentially what Solomon said centuries, or miliads, ago. The newest seeming thing, though, just now is the automobile—or, if you prefer to call it mobile, locomobile, simply auto or horseless carriage, you can do so, as it has these and other suggested names.

Few people, perhaps, remember that in 1827 Gurney, of England, built a road wagon that was propelled with some success by steam. American papers of that date—particularly the New York *Mirror*—gave some account of it, and also illustrated it. It was in form something like a farmer's heavy two-horse freight wagon. Another, of a somewhat different style, was tried about the same time in Springfield, Mass. Just why neither of these became a permanent success is not far to seek. Neither English nor American highways seventy-three years ago were fit for an automobile, while a certain number of our modern highways, if not all of them, are fairly well developed for its use. In addition to this, the progress of invention and the use of new materials have now made easy the already assured success in automobile travel.

Inasmuch as what is needed surely comes, if only by degrees, the improved highway is already developing, both by the foresight of communities and the force of inviting and compulsory legislation. The bicycle has done something to mend and better our public roads, and it is reasonably expected that the automobile will do the rest.

Besides all this, the advantages of a self-propelled carriage are too many and too important not to see. Its boon to cities and the larger towns will prove in time incalculable. The horse, no doubt, will survive this new vehicle's invasion, but he will be nobler, cleaner and fewer in number in the very near future. Under present conditions public health and municipal cleanliness are seriously menaced by the thousands of horses that have hitherto been a necessity. Travel in the country will have a new impetus and pleasure, when there is no overdriven and overheated animal to sympathize with in the effort to attain the end of your journey. The dust will go behind you, or be laid by some automatic sprinkler, the whip and whip-socket will be discharged; there will be no pause for oats, and the horse-fly will cease to annoy, while harness, fly-nets and watering-tubs can go into repositories to keep the company of ancient armor and other curios of a forgotten date.

The public has found out already that for certain work no vehicle can rival the one that is self-propelling. The doctor, the chief of a fire department, our large department stores and the cabman now employ it to great advantage. In fact no wheeled service is beyond the reach of this motor. It can be yoked for commercial use or for pleasure simply. It makes the business of transportation a pleasure and open-air riding a delight not easily imagined. It gives oxygen to the blood of the passenger,

and almost puts the feeling of wings on the shoulders. We need not now envy so much, as most people do, the celerity of the bird, for he, inspiring as his power and motion undoubtedly are, cannot sit down on his journey. He must even " paddle his own canoe," but the automobile matches pretty nearly a bird's average speed and takes you along with luxurious privilege. The instructed driver of it has merely a pleasant diversion in directing it, and needs no coachman.

It is doubtful if any new article of manufacture during this century of multiplied inventions has ever created for itself, almost at once, so great and increasing a demand as the automobile. The statement would hardly seem credible, if we did not know it to be so, that there are now not less than two hundred different styles of automobiles in the world's markets, each claiming more or less merit.

CHAS. W. SPURR, JR.,
Secretary, Automobile Club of Long Island.
New York, N. Y.

England will be well to the fore in the next race for the Gordon Bennett Cup. No less than five 50 horse-power Napiers are to be put on the stocks forthwith, chiefly with a view to this event. They are to be built to the order of Lord Carnarvon, Count Zborowski, Mr. Mark Mayhew, Hon. C. S. Rolls and Mr. Edge, respectively. It is said that they will be of little use in England, as it will be impossible to let them out to anything approaching their full power; but in France, where one can often see five miles ahead in a straight line, fast driving is another matter.

The fifth meet of the Automobile Club of Philadelphia took place October 27, 1900. At 3.30 P. M. the under-mentioned members and their guests left Broad and Walnut streets for Essington. This point was reached, after a pleasant run, at 5 P. M. After dining at " The Orchard," the country home of the Athletic Club of Philadelphia, the party returned to Philadelphia.

Present—Henry G. Morris, James Elverson, Jr., and guest, Pedro G. Salom, Walter B. Smith, C. W. Kelsey and guest, Frank C. Lewin, J. B. Entz, T. B. Entz, Captain John S. Muckle, John L. Wilson, Herbert Warden and guest, Louis J. Kolb and guest.

The run was made without mishap and all kinds of machines were present.

Notes from Abroad

Mr. Paul Meyan, editor of *La France Automobile*, one of the leading French motor journals, has recently performed some wonderful climbing with his vehicle. He drove it up 54 miles of a road which rose about 6,760 feet above sea level.

The recent trials of alcohol as a substitute for gasoline for motors were an unqualified success. The route which the competing vehicles used was between Paris and Rouen. There were fifty-one starters, whereas, a year ago, on the occasion of similar trials, there were but six. Of the fifty-one that started thirty succeeded in running from Paris to Rouen, a distance of 78 miles, in six hours. A close inspection did not reveal any visible exhaust, save in a few instances. Although the odor from burnt alcohol is not so conspicuous as the odor from gasoline it is much more disagreeable.

Mr. A. Harmsworth, a prominent English newspaper man and a member of the Automobile Club of Great Britain, has offered a cup valued at $25 for the motor vehicle which, on its arrival at a certain point after covering a given distance, shall present the cleanest appearance.

There is something very practical about this, as it ought to be the aim of motor vehicle operators to keep their carriages as clean as possible. The donor of the cup referred to was led to do so because he thought the public became prejudiced against automobiles by seeing them arrive in towns after long rides in a dusty, uncared-for condition.

A number of our British contemporaries are devoting considerable space to the question of utilization of motor vehicles in military work. This is a subject which has not been brought to the front in this country as abroad, but it is coming, and there are a number of signs which indicate that the army authorities of the United States are alive to the importance of the subject, and are showing a willingness to help in any way they can to further the cause of the military motor carriage.

The Automobile Club of France, at the proposals of that champion of automobilism, Count De Dion, has decided to organize a 1,000-mile tour patterned after the similar trial carried out by their British neighbors.

Battery Stations of the Future

The utility and convenience of the electrical vehicles is recognized by everyone interested in the subject of automobiles, and there is no doubt that they would be much more largely used in the suburbs if it were not for the necessity of recharging frequently. This usually means from two to five hours at the charging station at best, and as these are few and far between in small cities and towns it becomes a question of comparatively short rides (assuming that you have a charging station near home) or of running the risk of finding a stray power plant that can charge the battery for you.

We have no doubt that a comparatively short time will see the establishment of charging stations at intervals along main traveled roads near the large cities, but the delay necessary for recharging would still be an objection. If this were overcome it would give the electric vehicle a decided impetus, as it has many desirable features.

The first step toward a solution would seem to be for the builders of electric vehicles to get together and decide on standard dimensions for batteries, so that they can be intercharged. Choose a unit suitable for the smallest vehicle likely to be built—say twelve inches square and ten inches high. Two units would then occupy a space twelve by twenty-four inches and ten inches high and more, in proportion, but they could be in whichever shape was most convenient for the body of the vehicle; *i. e.*, either end to end or side by side, or any desired combination.

This would allow different batteries to be used in your carriage and would facilitate the establishment of a series of "battery stations" all over the country. These need not be expensive installations, as a small engine and dynamo can charge a large number of batteries in a day, if worked under a steady load. Then the user of the electric carriage who was in need of recharging would stop at a battery station, exchange batteries and go on to his destination, possibly charging a number of times at different points on the route. He could either pick up his own battery on his return or have it sent to him if he should take another route home.

A plan of this kind almost of necessity requires a large corporation to manage it, and it might even assume the position of supplying the batteries to the makers of carriages, in which case it would not be necessary to return the particular battery at the

end of journey. It might be arranged on the basis of battery rental per hundred miles, with certain rebates if they failed to perform the work guaranteed.

Of course this is a trifle visionary at present, but it seems as though something of the kind was necessary in order to give the electric carriage its widest field of usefulness. The suburbanite who is electrically inclined is prevented from using his favorite machine by the difficulty of charging at home and the limitations put on his wanderings by the mileage of the battery.

Automobile risks are attracting the attention of underwriters of accident policies in the United States, and the fire hazards are creating considerable interest abroad. Some serious losses have resulted from the destruction of motor carriages. A writer in a foreign insurance journal recently described two heavy losses: "A friend of mine, manager of a leading insurance office, issued a policy of £700 upon an automobile, rate two guineas per cent. The owner and his wife were going for a ride, and had just taken their seats, when, before it had even moved, the automobile became a sheet of flame. No efforts of the groom made any impression on the fire, and in a few minutes nothing was left except a barrow load of old metal. Fortunately no one was injured. The sum of £500 was accepted in settlement of the damage.

"Again, only recently, a motor car was being driven from Harrogate to Leeds. Half way on the road a pair of nervous horses were met, and the car driver had reason to rapidly apply his brakes, when over went the car into a ditch. The petrol at once fired, and in an instant the whole was a mass of flame. The owner of the vehicle was standing near, an interested spectator, watching his £500 motor consumed.

"Quite apart from the hazard, nothing could be more unsatisfactory to insure, because upon the slightest accident by fire to a good motor car the whole has generally to be returned to the makers, frequently in Paris; and, what with the monopoly, the delicacy and skill of workmanship necessary, together with the high rates of such labor, etc., the bill generally works out to about the price of an entirely new vehicle."

Probably the different automobile clubs scattered throughout the country will find their greatest field of usefulness in their united efforts to promote the cause of good roads. A considerable number of the members of the Automobile Club of America look upon the work as of great importance and will push a fight along these lines.

Automobile Exposition at Grand Central Palace

THE above exposition opened on the night of November 14 and gave promise of a very successful show. Many of those who had had space at Madison Square Garden were in evidence, as well as a goodly number of firms who were not represented at the previous exhibition. From the time the first show closed on Saturday, November 10, the exhibitors were busy removing their products to Grand Central Palace for another stay of ten days.

The Palace show affords room for many manufacturers not represented at the Garden, and have been given reserved places for vehicles that will be on view for the first time. Its arrangement will be in marked contrast to the Garden exhibition, where the principal exhibits were placed within the track, thereby obscuring the view of the moving vehicles to a certain extent. At the Palace the track is the central feature, occupying the entire auditorium, and the exhibits are distributed around the track, a wide aisle intervening. A clear view of the entire track circuit is obtainable from the two commodious balconies of the auditorium. The space within the track is reserved for exhibitions of expert handling of automobiles. The track is made of double flooring, smoothly planed and closely fitted, no nails being used in its construction, all joints being fastened with screws. This makes the track very smooth. Landing stages, aside from the direct track, are provided to enable passengers to be taken on and off the vehicles without delaying those in motion. Features of the daily programme include afternoon and evening concerts by the famous Old Guard Band. All contests will be arranged by and conducted under the direction of a committee of the manufacturers exhibiting. The hall itself is beautifully decorated and illuminated, making the exposition a very attractive spectacle.

Among other things at the show is an automobile in which for the first time liquid air will be used as motive power. Liquid air has, of course, been made commercially for some time past, and it is only a matter of time, probably, when someone will devise some means by which it can be used economically. Its application at present is quite limited, and the automobile referred to is probably the first instance in which liquid air has been called into practical use.

The Cooke Locomotive Company, of Paterson, N. J., exhibits a practicable and, we should say, serviceable steam wagon designed for heavy service. It is constructed on what is known as the Thornycroft system. The boiler is placed in front. Coal is used as fuel, and the wagon exhibited is equipped with a horizontal compound engine of 25 horse-power. Like a great many of the English heavy wagons, it is so arranged that any type of body suitable to the work required can be put on. The wagon has been in continuous service about the Cooke shops for three months past. Undoubtedly there is a great field for such class of wagons, and after making a short run in one our conclusion is that there is every probability of a great demand for them. They run smoothly even when a speed of 8 miles per hour is being made. Solid tires are used, and the wagon as a whole is not at all out of proportion to the nature of work for which it is intended.

The first night of the show was, so far as the number of visitors was concerned, quite encouraging, and the Palace presented a very gay appearance. The booth of the Tripler Liquid Air Automobile Company was continually surrounded by a crowd of curious ones, anxious to learn all they could about the new motive power. Owing to an accident which had taken place at the company's compressing plant, it was not possible to obtain the necessary liquid air to drive the motor.

Items of Interest

(Readers will confer a favor upon the editors of this magazine by sending in any interesting item of news suitable for this department.)

It has been felt among automobile manufacturers for some time that something should be done in the way of an organization for the furtherance of the good roads problem, and to this end there was held, November 14, a meeting at the Hoffman House, New York City, to talk the matter over. At the meeting referred to the following organization committee was appointed: John Brisben Walker, S. T. Davis, Jr., of New York; A. L. Riker, of Elizabethport, N. J.; C. J. Field, of Brooklyn; J. M. Hill, of New York; A. W. Winslow and E. P. Wells, of Keene, N. H. About the only business conducted was the appointment of a Committee on Charter, etc., a Committee on By-laws, and a Committee on Legislation.

Items of Interest

Gen. Gallieni, a high French military authority, went to Madagascar lately and traversed the country in automobiles. He first used petroleum omnibuses where the roads were fairly good, and then, while passing through the forests, rode in a voiturette. There were heavy grades and rough roads, but he managed to make very good time; in some places as high as 11 miles per hour. The natives were tremendously surprised at the way the petroleum automobiles went along, and it is expected that in the near future sufficient improvements will be made on the roads in Madagascar to employ them for transportation of both freight and passengers.

Until the present sweeping restrictions in regard to gasoline are relegated to the "has beens" the question of what can be done to make it as little annoyance as possible confronts us. How would it do for the oil companies to establish a small warehouse on each side of the river near some convenient ferry? Have receptacles in which you could drain your oil tanks and label them with your name, to be called for. Or they could give you a credit check good on the other side for an equal amount. This, of course, presupposes the oil to be of standard quality. Arriving on the other side you fill up from their stock and go ahead. This necessitates a little pushing of your machine, but although this isn't pleasant, it is preferable to not getting across at all.

It is hoped that operators of motor vehicles will not make the mistake which many bicyclists make of running at very high speeds, making it dangerous for pedestrians. Accidents are becoming more numerous. It will not benefit the interests of the automobile any if the frequency of accidents caused by reckless driving is increased, and we trust cautiousness on this point will be observed by operators. Especially is this desirable on dark country roads, where street lamps are not so numerous as in cities.

At the recent automobile exhibition and race meet in Chicago a novel method was adopted by a smart driver of illustrating the niceties of control of which a motor vehicle is capable. The vehicle in question was a delivery van, and for display purposes a large framework was built in front of the grandstand after the manner of a see-saw. Up this the car was driven, and worked backward and forward at the balancing point, thus causing the see-saw to rock. A box was then placed in the centre of the track and the car was driven over it with such control that an egg placed on the opposite side of the obstruction was cracked, but not crushed.

The recent show at Madison Square Garden was an eye opener to many who visited it. There was a very general opinion that the number of different styles of automobiles was limited, and surprise was felt when so many varied types were shown. As illustrating this, one old lady from a small country town, upon seeing such a large number of vehicles, was heard to say to her husband, "Lord, William, we have only got one of them things in our town." We are inclined to think that not only to country visitors, but also many residents of our city itself, the show was a revelation, so far as variety of style is concerned.

There is in France an institution called the "Academy," which exercises supervision over literary matters and is composed of an extraordinarily influential set of people. The French language needs a good deal of supervising and these people find pleasure and probably some amusement in keeping the language in order. There is no neuter gender in French, so everything has to be masculine or feminine. The "Academy" gives forth the rules to be followed with new words. They have lately decided that the word "automobile" is masculine. What is trying to a poor memory is that "locomobile" has been declared a female. We have been greatly puzzled to make out the reason for the distinction, but incline to think that reason has been excluded in the decision. To make one masculine and the other feminine by *fiat* is just as sensible as habit has been which calls night feminine and evening masculine.

Items of Interest

One of the things which many American automobilists discover is the apparent lack of good literature on the subject of automobile construction and operation. There are few books which have been published in this country on the subject. There are, however, a great many French books, but the trouble is we do not all read that language. English writers have also devoted some time to putting into book form their knowledge of the construction and operation of motor vehicles. It is, of course, not to be expected that at this stage of the industry we should have many books on the subject. It is certain that as development takes place the necessary literature will make its appearance, and this country's contribution, we feel sure will not by any means be behind that of others.

An automobile drivers' union was recently organized at No. 126 Washington Street, Chicago, under the jurisdiction of the International Brotherhood of Electrical Workers, which is affiliated with the American Federation of Labor. While there are several stages in the process of evolution between an automobile driver and an Edison, it is said that the Electrical Workers' union is the proper place for the men who pilot the " auto."

It is said that 90 per cent. of the 400 automobile drivers in that city will become members. Their weekly salary is said to vary from $5 to $10, and the object of the new union is to try and secure better remuneration for the men who are engaged in repairing the machines.

Columbia University Automobile Club held its first annual meeting October 30 to elect officers for the season. Henry Rossiter Worthington, formerly Vice-President of the club, was agreed upon unanimously as President. William Brock Shoemaker was elected Vice-President.

After the election of Lewis Iselin, '03 College, as Secretary and Treasurer, and of Roscoe Crosby Gaige as Manager, there was some discussion as to the admission of new members. Several new members were elected.

A Horseless Stable

THE housing of an automobile is, to a great many, a perplexing problem, much more so than in the case of the familiar "wheel," which, being small, can be run into some corner of a closet or made to stand in the hall. This, however, is not possible with the automobile, and while it is one thing to own a vehicle it must need have ample room in which to be housed and cleaned when its condition necessitates it. It is

A Horseless Stable

essential that it be kept up, especially its runing parts, and suitable quarters for doing this are absolutely necessary.

It is probable that in a great many instances the public are prejudiced against the motor vehicle by the sometimes shabby appearance presented by certain of them. This question of cleanliness has so been impressed upon the mind of Mr. Harmsworth, a prominent English automobilist, as to lead him to offer a cup valued at $25 to the automobile which presents the cleanest appearance after a run of a given distance.

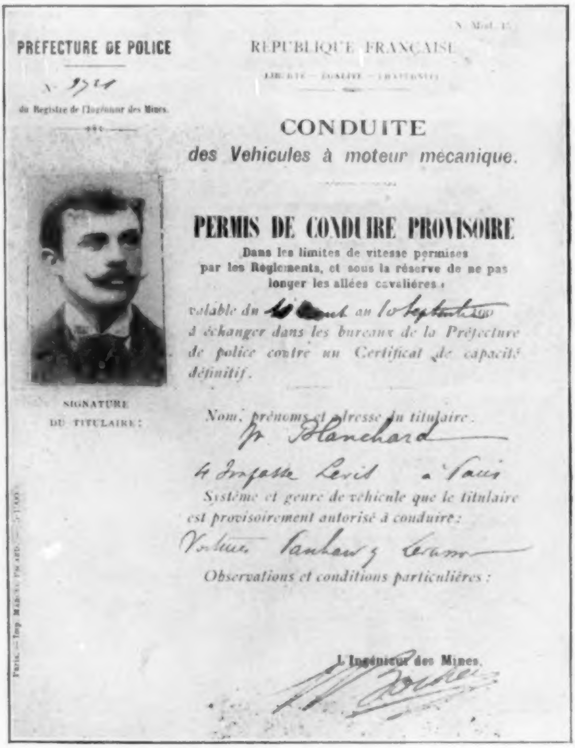
A Horseless Stable

In order to keep automobiles up to the right standard of cleanliness and repair it is necessary either to have a house so constructed as to make it convenient to wash the carriages and provided with a pit, thus enabling the man delegated to overhauling the carriage opportunity to get at the working parts without having to lay upon his back. It is hoped that some day the running parts of motor vehicles will be so arranged as to make such a proceeding unnecessary. Unfortunately, however, the majority of motor vehicles do not possess this valuable and time-saving feature.

Panhard Machine of Grant Lyman. French Chaffeur Seated

All owners of automobiles are not in a position to build, equip and maintain such a house for the care of their machines. Even those who possess private stable accommodation will find that the care of a horse is a proposition entirely different from the care of an automobile. To equip a suitable place for the care and repair of motor vehicles entails the expenditure of much money, and now that the new mode of conveyance is becoming so common on our streets storage and repair stations are springing up in our large cities, where the work of storing and looking

after automobiles for longer or shorter periods is carried on. These stations fill a real want, and especially are they valuable to out-of-town automobilists who visit the city for a short stay. Carriages may be left at these stations, and when called for will be found in a clean condition, oiled, and the gasoline necessary


PREFECTURE DE POLICE

du Registre de l'Ingénieur des Mines.

RÉPUBLIQUE FRANÇAISE

CONDUITE
des Vehicules à moteur mécanique.

PERMIS DE CONDUIRE PROVISOIRE
Dans les limites de vitesse permises par les Règlements, et sous la réserve de ne pas longer les allées cavalières :

valable du … au … à échanger dans les bureaux de la Préfecture de police contre un Certificat de capacité définitif.

SIGNATURE DU TITULAIRE :

Nom, prénoms et adresse du titulaire.
Blanchard

Système et genre de véhicule que le titulaire est provisoirement autorisé à conduire :

Observations et conditions particulières :

L'Ingénieur des Mines.

Permit Issued to French Chaffeurs

for the continuance of the journey, or, in the case of electric vehicles, current supplied direct from the plant on the premises.

Recognizing the rapid growth of motor carriages the Automobile Storage and Repair Company early in the present year established, at No. 57 West Sixty-sixth street, a station, which has since it founding handled a great number of carriages of all classes. The building is centrally located, and the main room

for the storing of vehicles is on the ground floor, thus obviating the use of elevators and the inconvenience attending them.

The illustration entitled "A Horseless Stable" shows the interior of the station, with carriages of various styles lined up on either side. Skilled mechanics are employed, so that repairs can be attended to on short notice. The station is equipped with apparatus for the proper washing of the motor carriages, just as is found in livery stables. As a convenience for patrons a private waiting-room with lockers has been provided. This same company has several other stations throughout the city.

If one is desirous at any time of seeing the various types of motor vehicles he ought to visit a station of this kind. Machines of foreign and home make are there, machines of all sizes.

An interesting carriage, which at the time of the writer's visit was being cared for at the station, was that of Grant Lyman, M. D. It is an 8 horse-power Panhard et Levassor carriage. When shown at the recent exhibition in Madison Square Garden in connection with the Loan Exhibition of the Automobile Club of America it attracted considerable attention. Our illustration shows it drawn up in front of station with its French operator seated in it.

In France the matter of licensing operators of automobiles seems to be looked upon with greater importance than here, and great pains are taken to insure that they be competent in every respect.

The accompanying illustration is a *facsimile* of the license issued to *chauffeurs* of automobiles in France. The permit shown is only of a temporary nature, and is signed by the Engineer of Mines. It also states the speed limit, with a restriction not to enter bridle paths reserved for horsemen. A space is left in which a portrait of the holder is placed.

Automobile Clubs in New England

By O. L. Stevens

THE Worcester Automobile Club, which was recently formed, is proving quite a successful organization. It was organized about the middle of August and since then has had quite an eventful career. It is an aggressive institution and is looking forward to a career of great usefulness in the world of automobiles.

Officers of the Worcester Automobile Club

The first meeting to discuss the subject of forming a club of local automobilists was held in the Locomobile Company's office and an organization was effected, making Mr. James E. Farwell their President; Mr. James W. Bigelow, Vice-President, and Mr. Henry T. McKnight, Secretary and Treasurer, with Mr. W. A. Sutton as Chief Marshal. The members first enrolled, beside

these, were: Mr. O. M. Savels, Mr. E. P. Smith, Mr. R. E. Durkee, Mr. H. C. B. Fanning, Mr. E. P. Sumner, Mr. Granby A. Bridges, Mr. J. W. Harrington, Mr. E. C. Harrington, Dr. E. G. Hoitt, Dr. C. L. Cutler, and Dr. E. H. Ellis, of Marlboro; C. R. Moules and George A. Ritchie. Mr. Sutton called this first session to order, and Mr. Savels, as temporary secretary, made the first record. By-laws and constitution were provided for and the club was started with all necessary formality and considerable enthusiasm. The members even sat around long after the business of the meeting was over talking about their

Mr. J. Ransome Bridge (President of Massachusetts Automobile Club) and Mrs. Bridge

respective machines, and telling what had gone well or ill with them on the road, as all true enthusiasts will.

A run to Lancaster took place the following Sunday, and other runs followed at intervals all through the fall. In September some of the club members entered in the first automobile races of the county at the Worcester Agricultural Fair. The club has grown steadily until it now numbers about forty. One or two changes in leadership have been made, principal of which has been the selection of Mr. W. J. H. Nourse as Chief Marshal. The members are skilful automobilists almost without exception. For indoor gatherings there have been addresses by guests or visitors on subjects of interest to the automobile owner, and it is likely

that meetings of this sort will be a feature of the club life this winter.

Though the Worcester Club has the distinction of being first in the New England field, there was an interesting association of automobile users among the students of Harvard University in existence as long ago as the fall of '99, and more recently automobile clubs have been formed in Providence, R. I., and in Boston. The Harvard organization has never been formal, its members merely club together in renting and fitting a neat little automobile stable of their own, and in hiring caretakers. The Providence club has had one or two successful club runs, while the Boston club, as yet in its infancy, is incorporated under the name of the Massachusetts Automobile Club, and has for its officers Mr. J. Ransome Bridge, President; Mr. L. E. Knott, No. 16 Ashburton place, Secretary, and Mr. Conrad J. Rueter, a Pemberton Square lawyer. John B. Walker, Jr., of the Mobile Company, is one of the Directors, and so is Captain Homer W. Hedge, well known as the ex-Secretary of the Automobile Club of America. Both the Rhode Island and Boston clubs have practically the same objects as the Automobile Club of America, and are looking to include a representative number of the automobilists in their respective districts. There will be more to say about them before the winter is far advanced.

The initial run of the Worcester Automobile Club referred to took place August 19, 1900, when twelve carriages were in procession.

THE COST OF MOTOR VEHICLES

"When automobiles are cheaper I'll get one," is heard on every hand, and there is little doubt that the numbers in use will largely increase as the prices gradually go down. But people do not realize the reasons for high prices and fondly imagine that next year—or the next, at most—a first-class machine can be had for two or three hundred dollars. We fear they are doomed to disappointment for various reasons.

The cost of building and selling a good machine is more than most people imagine, and add to this the demand in excess of the supply, and there is very little reason for a drop in price at present. The cost of new designs, of experiments in new directions and of demonstrating the machines, must all be added to the actual expense of manufacturing. When the standard typewriters are considered and the fact that their price has been practically the same for years, the chance of automobiles being sold very low is extremely remote.

Automobile Club of Long Island

THE Automobile Club of Long Island was recently organized and incorporated under the laws of New York for the express purpose of fostering and encouraging social relations among members, to promote and encourage the construction and maintenance of good roads, the obtaining and upholding of whatever rights automobilists have, either as owners or users of all kinds of self-propelled vehicles; to investigate the development of motor vehicles; the giving of race meetings, parades, touring and other sporting meets incident to motor vehicles; for the general good of the sport, as such, and as a pastime. The club is strictly a social club, supported by members' subscriptions, and not for profit. There are three classes: honorary, resident and non-resident members.

During the winter lectures will be given pertaining to automobiles, papers will be read and members will be advised by the committee respecting the automobile condition of various roads.

The officers are as follows: President, Louis R. Adams; Vice-President, Robert Darling; Treasurer, F. G. Webb; Secretary, Charles W. Spurr, Jr. Headquarters are at No. 104 Flatbush avenue, Brooklyn.

Book Review

There are a number of valuable treatises upon the gas engine, but perhaps one of the most useful is that written by Frederick Grover, copy of which lies before us. The author goes, first of all, into the construction of early and late types of successful gas engines, from which he proceeds to chapters on the practical design of gas engines. Part 2 is devoted to petroleum engines. Numerous illustrations are included, and altogether the book should be of value to all who have to do with the construction and operation of gas engines. It is published by the Technical Pub. Co., No. 31 Whitworth street, Manchester, England.

Run of the Automobile Club of America

SHORTLY after 10.30 A. M., Saturday, November 17, automobiles of all styles began to assemble in Astor Court ready for the run of the Automobile Club. About 11 o'clock the different automobilists took their places; the buzz of wheels was heard, and one by one the motor vehicles drew away. Mr. Bostwick in his Winton racer acted as pacemaker until the Harlem river was reached. After leaving this point good time was made by several of the vehicles, although one or two were obliged to stop on the road owing to slight mishaps. There was not, however, any serious accident.

The route lay through Yonkers, Dobb's Ferry to the Ardsley Club-house, where lunch was served. About thirty-six sat down, the number of vehicles in the run being 15 or 17. Among those present were: A. C. Bostwick, C. J. Field, Grant Lyman, G. F. Chamberlin, Howard Willets, Paul Thebaud, Robert Graves, W. E. Buzby, M. W. Ford, J. D. Wright, C. C. Wridgway, S. T. Davis, Jr., and F. W. Tousey.

After lunch the run continued to Tarrytown, through White Plains to Marmaroneck Village, along the Post road to New Rochelle back to the city. The run was a decided success.

It was noticed that upon reaching Ardsley certain of the automobilists thoroughly inspected their vehicles, saw that oil cups were filled, nuts were tightened, tires were in good condition, while others seemed quite indifferent. Perhaps we would hear of fewer accidents if automobilists, when they come to a halting place, would inspect their machines before continuing on their way.

M. Lenoir, who is credited with having been the father of the modern automobile, died recently in Paris in poverty. Lenoir was a chemist, and in 1860 took out a patent for a motor driven by an explosive mixture of air and gas, and even used electric ignition. He seemed to have anything but good fortune in the promulgation of his invention, as most of those to whom he explained his idea considered that it was not of any value. In 1862, however, his carriage made a number of short trips through the streets of Paris.

Automobile Club Directory

Under this heading we shall keep a record of the motor vehicle clubs both of this and other countries, and we hope to have the co-operation of club officers in making it accurate and complete.

Automobile Club of America, Malcolm W. Ford, Secretary, 203 Broadway, New York; representative on International Racing Board, Clarence Grey Dinsmore; Substitute, John H. Flagler.

Automobile Club of New Jersey, President, Kirk Brown; Vice-President, W. J. Stewart; Treasurer, H. W. Whipple; Secretary, Dr. H. Power.

Automobile Club of Baltimore, W. W. Donaldson, Secretary, 872 Park Avenue, Baltimore.

Automobile Club of Columbus, O., C. M. Chittenden, Secretary, Broad Street.

Chicago Automobile Club, Secretary, H. M. Brinkerhoff, Monadnock Block, Chicago.

Automobile Club of Long Island, Secretary, Charles W. Spurr, Jr., 104 Flatbush Avenue, Brooklyn.

Cleveland Automobile Club, L. H. Rogers, Secretary, Cleveland, O.

North Jersey Automobile Club, E. T. Bell, Jr., Secretary, Paterson, N. J.

Automobile Club of Rochester, Frederick Sager, Secretary, 66 East Avenue, Rochester, N. Y.

Massachussets Automobile Club, President, J. Ransome Bridge; Treasurer, Conrad J. Rueter; Secretary, L. E. Knott, 16 Ashburton Place, Boston, Mass.

Pennsylvania Automobile Club, Secretary, Henry J. Johnson, 138 No. Broad Street, Philadelphia.

Philadelphia Automobile Club, Frank C. Lewin, Secretary, 250 No. Broad Street, Philadelphia, Pa.

San Francisco Automobile Club, B. L. Ryder, Secretary, San Francisco, Cal.

Columbia College Automobile Club, Lewis Iselin, Secretary, Columbia College, New York, N. Y.

Buffalo Automobile Club, George S. Metcalf, Secretary, Buffalo, N. Y.

Worcester Automobile Club, Worcester, Mass., President, J. E. Farwell; Vice-President, J. W. Bigelow; Marshal, W. J. H. Nourse; Secretary-Treasurer, H. T. McKnight.

AUSTRIA.

Budapest—Magyar Automobil Club, 31 Musem Korül.

Innesbruck—Tiroles Automobil Club, Rudolph-Strasse 3.

Prague—Prager Automobil Club.

BELGIUM.

Antwerp—Automobile Club Anversoir, 34 r. Longue de l'Hopital; President, Baron de Bieberstein.

Brussels—Automobile Club de Belgique, 14 Pl. Royale; Moto-Club de Belgique, 152 Boul. du Nord; Touring Club de Belgique, 11 r. des Vauniers.

Charleroi—Automobile Club de Charleroi, Hotel de Esperance.

Ghent—Automobile Club de Flandres.

Liege—Automobile Club, Liegeois, 2 r. Hamal.

FRANCE.

Amiens—Automobile Club de Picardie, 36 r. de La Hotoie.

Avignon — Automobile Club de Avignon.

Bordeaux—L'Automobile Bordelais.

Dijon—Automobile Club, Bourguignors Cafe Americanie.

Lyon—Bicycle et Automobile Club de Lyon; Motor Club de Lyon, 3 pl. de la Bouise.

Marseilles—Automobile Club de Marseilles, 61 r. St. Fereol.

Nance—Automobile Club, Lorrain, Thiers pl.

Nice—Automobile Velo, Club de Nice, 16 r. Chauvain.

Paris—Automobile Club of France, 6 pl. de la Concorde; Motr-Club de France; Touring Club de France, 5 r. Coq-Héron.

Pau—Automobile Club, Bearnais Ave. de la Pau, President, M. W. K. Thorn.

Périgueux—Veloce Club, Perigourdin, Hôtel de Commerce.

Toulouse—Automobile Club, Toulousain Café Riche, pl. St. Etienne Société des Chaffeurs du Midi, 25 r. Roquelaine. President, M. Gay.

GERMANY.

Aachen (Aix la Chapelle)—Westdeutscher Automobile Club, Hotel Grand Monarque.

Berlin — Mitteleuropaischer Motor Wagen Verein, I. Universitatstrasse, Herr A. Klose; Deutscher Automobil Club, Luisenstrasse, 43-44.

Dresden—Radfahrer-und Automobilisten Vereinigung; Dresdener Touren Club.

Eisenach—Mitteldeutscher Automobil Club; Motorfahrer Club,Eisenach.

Frankfort am Main — Frankfurter Automobil Club, Restaurant Kaiserhof.

Munich—Bayer. Automobil Club, 33 Findling Strasse.

Stettin—Erster Stettiner Bicycle und Automobil Club.

Strassburg—Strassburger Automobil Club.

Stuttgart — Suddeutscher Automobil Club; Wurtembergischer Motor Wagen Verein.

GREAT BRITAIN.

Birmingham—Motor and Cycle Trades Club, Corporation street.

Edinburgh—Scottish Automobile Club.

Liverpool—Liverpool Self-propelled Traffic Association, Colquitt street. Secretary, E. Shrapnell Smith.

London—Automobile Club of Great Britain and Ireland, 4 Whitehall Court, S. W. Hon. Secretary, C. Harrington Moore.

Nottingham Automobile Club, Secretary, A. R. Atkey, Nottingham, England.

HOLLAND.

Nimegue—Nederlandsche Automobile Club.

ITALY.

Milan—Club Automobilisti Italiani 6 via Guilini.

Turin—Automobile Club d'Italie Via Vittorio Amedeo II, 26.

RUSSIA.

Moscow—Moskauer Automobile Club, Petrowka, Hauschnow.

St. Petersburg—Automobile Club de Russe, President, M. Delorme.

SPAIN.

Madrid—Automobile Club de Madrid.

SWITZERLAND.

Geneva—Automobile Club, de Suisse, 9 boul. de Theatre.

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ABOUT INDEXES

Some one has said, "A good book deserves a good binding." We go further and say, "A good book or paper deserves a good index," one as full and complete as it is possible to compile. There are a great many works of reference which contain veritable mines of information, but have extremely incomplete indexes. This fault in so many books is a real one, and the source of a great deal of annoyance.

In these days men want to get their information in the minimum of time, and when it is necessary to consult books for it they do not feel as though they can afford to wade through page after page when they could be cited to what they are looking for almost immediately if the index in the book were just as it should be.

What is true of books is also true of journals which are likely to be after referred to. To cite an instance: The other day we desired to find an article describing a certain form of gasoline motor. We knew the article referred to had appeared in a cer-

tain journal devoted to the automobile industry. Naturally we turned to the index and looked under the words "gasoline" and "motor," but found that the article had not been indexed under either. After looking for some time it was found indexed under the word "the," the title of article having read "The Gasoline Motor." We think there is no excuse whatever for a thing of this kind.

No two men compile an index in exactly the same way, and the only safe rule for an indexer to follow is to put himself in the place of as many of the readers as much as possible.

It is our intention to compile and send out with the January issue of the AUTOMOBILE MAGAZINE a very full and complete cross index of every number of the magazine since its inception, October, 1899.

No pains will be spared to make it thorough, each article being cross indexed, so that should a reader fail to find a given article indexed under one word he will under another.

This index will not, as heretofore, be bound in with the other pages of the journal, but will be separate, so that in case readers should for any reason wish an extra copy it can readily be supplied.

AUTOMOBILE CLUBS AND THE DEVELOPMENT OF THE AUTOMOBILE INDUSTRY

In the early days of the bicycle there was perhaps one factor more than any other which contributed to the great demand for wheels, and the general desire to know more about the bicycle and the pleasures to which it gave birth. That was the bicycle club.

When you can bring men and women together who are interested in a common theme, and bent on one specific purpose, you have, perhaps, the strongest force necessary to further any given object. When the bicycle club first became popular men began to form themselves into clubs and to talk about their respective clubs; bicycle runs were instituted between the various clubs, and by this means the bicycle was the connecting link between circles of men interested in the wheel. This undoubtedly contributed, in a large measure, to an increased demand for wheels.

We cannot help ourselves from influencing others. It is a law which exists in spite of ourselves, and we all bow to it.

As it was with the wheel so will it be very largely in the case of the automobile. As the members of one club meet with those

of other clubs, it is fair to assume that the principal topic of conversation will be the automobile in all its bearings. This interchange of opinions cannot help but be beneficial to the growth and development of the industry.

Automobile clubs are being formed in many sections, and the social intercourse which one club has with another will lead to a more general desire to know more about the new mode of conveyance, resulting in increased sales.

The Personal Factor in the Success of Automobiles

ONE of the conditions that must be considered by builders of automobiles is the effect of different methods of handling due to the difference in people's natures. A machine that gives excellent service when properly handled by an expert may fail completely in the hands of another, due to different manipulation. This is true of any machine and also of horses. As Mr. I. B. Rich so clearly showed in his brief but pointed article in the October issue, a man who is careful gets along nicely where his neighbor—who, in this case, killed three horses in one summer—gets into trouble.

There would seem to be two ways of dealing with this phase of the question. One to make every part of the carriage and motor so that it cannot be used wrongly, and the other to allow a wide margin of variations in handling without damaging either the machine or the rider. The first would be preferable if it were not well nigh impossible, but the latter seems the most feasible course to pursue. If it were possible to so build a motor that it couldn't help running right under all conditions, there would remain but the one or two personal features—the steering and the regulation of speed. The latter is amenable to law, whether accidents happen or not, but the former depends largely on the nerves of the man behind the lever. If he is an individual who loses his nerve easily, there is no telling what may happen, and a nerve tonic is in order.

The Final Automobile

Hugh Dolnar

III.—CLUTCHES

SUPPOSING a motor wagon to be fitted with a suitable motor, cylinder-fired, the motor being small and certain to run when desired, and that the motor cylinders are supplied with a fixed quantity of fuel for each working stroke, this amount being capable of ready variation at the will of the driver, so that the motor will work strongly or feebly as may be required. If this motor has sufficient piston area and is suitably geared to the driving wheels, it will drive the wagon forward with more or less power according to the amount of fuel supplied for each cylinder charge. As so far specified, this motor will not drive the wagon backward, because the cylinder-fired motor is not capable of being reversed in any approved form now known.

Again, such a motor is strongest when it is given all the fuel it can burn, and is also run at its highest speed at all times. Hence, if it is desired to have the motor do its uttermost to drive the wagon at either a fast or slow rate of advance, speed change gearing must be placed between the motor shaft and the driving wheels, and if the wagon is to be capable of running backward as well as forward, a reversing gear must also be supplied.

A common arrangement of motor gearing gives two speeds or three speeds forward and one speed backward. As to the need of a backing gear, there can be no question. Although the backing gear is but seldom required on country roads it is an essential requirement in crowded streets, and is not unreasonably demanded by law in some countries, because it may be the means of avoiding accident and even saving life itself.

It is a very easy matter to apply any desired speed gear changes to an automobile, and if the teeth of the gears are spiral, the change gears will run without much noise. Spiral gear teeth cause an end thrust on the supporting shaft which is regarded as highly objectionable, and because spiral gearing is not much used it is more costly than plain speed gearing. If such bearings as are shown in the first paper of this series are used, then the end thrust will be perfectly taken care of without any trouble. The angle of the spiral gear teeth can be quite small, as little as from seven to ten degrees angularity being enough to make the gearing run quietly.

Some systems of motor wagon gearing include bevel gears. The bevel gear is always troublesome. It is costly, and demands absolute precision of location, and gives a heavy end thrust and is noisy at high speeds. These faults belong to the bevel gear, and neither skillful designing nor good workmanship will avail to remove them, and because of these faults the bevel gear will not appear in the final automobile as a principal element of the driving mechanism.

Epicyclic trains of motor wagon gearing are often shown, and are often shown with pinions of extremely small radius. The epicyclic gear train has a certain fascination for the ingenious mechanic who has small experience in practical machine operation, because of the curious and often surprising effects which may be obtained by its use. Epicyclic gear trains are, however, very seldom seen in machines of established and widely accepted design.

Worm gearing has also been proposed for road wagon speed changes. It is generally supposed that the worm gear in any form is subject to great loss of power by friction, and consequently to rapidly destructive wear; while this is true of worm gearing having a low angle of worm thread inclination, it is not true if the teeth angles are made larger, and very compact, easily covered and readily lubricated arrangements of worm gearing suitable for wagon driving can be had. Worm and worm wheel gearing is subject to end thrust; this end thrust must be taken care of, and can be easily resisted by ball bearings either of the form shown in " Permanent Bearings," or by a ball thrust bearing arranged as in Fig. 11, which with 5/16-inch balls will resist any thrust set up in light automobile driving. Worm gearing is perfectly still and smooth in action at any speed, gives velocity changes without diameter changes and is in every way docile and tractable in the hands of the designer. If made with proper worm angles it is very durable, and operates with no more loss by friction than is due to good spur gearing, and cast-iron and machine steel work together extremely well as worm gears and worms in correctly designed systems which are protected from dust and abundantly lubricated.

It must be remembered that the friction on all gear teeth is constant and severe, and the longer the tooth addendum, the more extended the rubbing action. The worm gear has great advantages for automobile speed changing, and will undoubtedly appear in the final types of vehicles, especially for heavy work, where its great speed reductions with small diameter variations make it peculiarly suitable.

Supposing a satisfactory change of gear is placed between the motor shaft and the driving wheels, then it becomes needful to introduce some other devices which will enable the driver to place one of these speed changes in action and make it drive the wagon at its own special rate, while the speed of the motor remains unchanged and all the other speed change gears are idle.

Here the necessity for the clutch in some form appears. It is true that a speed change gear has been much used in automobiles, in which a shaft carrying various gears rigidly fixed thereto is moved endwise so as to successively place the gears it carries in mesh with other gears rigidly fixed to a shaft which has no endwise movement. This arrangement is simply barbarous. It avoids the clutch, is cheaply made, and is not easily disarranged. It is also certain in action; it has the vast and all overshadowing fault, however, of being incapable of speed change engagement except at very low rates of revolution, and this single fault is quite enough to utterly condemn the whole arrangement. No device which cannot be operated safely and easily at any rate of speed, from the highest to the lowest and from the lowest to the highest, has any place in a road wagon, because life may depend upon the quickness and ease with which the operations of the wagon can be varied. If this dogma be accepted, and it is certainly true, then a lot of requirements, some of which are not too easily met, are at once introduced in the automobile speed change problem.

First, all the speed change gears must always be in full engagement with each other, because toothed gears cannot safely be slipped or dropped into mesh with each other at high speeds.

Second, the change from one speed to another must not be by elements having a rigid and positive engagement, and yet the change must be made in the smallest fraction of an instant, and must become effective as soon as made, while at the same time there must be sufficient slipping and yielding between the engaged parts to make the speed change without shock or danger of breaking the gear teeth.

These two imperative conditions make the use of friction clutches in cylinder-fired automobiles unavoidable. Nothing else can possibly meet the conditions.

To be perfectly suitable for wagon work the friction clutch should be operated with very little muscular exertion, certain to engage, certain to release, and should be locked in full engagement without a locking movement of the driver's hand, and should occupy no space whatever. The clutch should also be effective when only partly engaged, and should drive the wagon

strongly and safely while slipping. All of these requirements can be fully met, except that of occupying no room, and this seeming impossibility can be nearly obtained if the clutch is placed wholly inside of the gear which it controls, only the lever connection end projecting outside of the gear journals.

The elements of the friction clutch are shown in Fig. 12, in which *A* is the driving member constantly turned by the prime mover, and *B* is the driven member, while *C* is a hand lever by which *A* can be moved toward or from *B*.

It is clear that if *A* is pressed with sufficient force against *B*, then *B* will be caused to revolve by the friction set up between

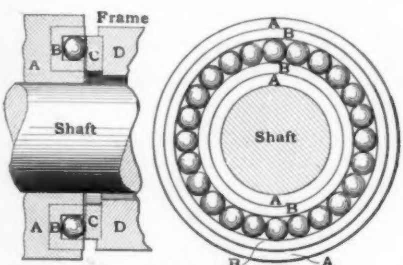

Fig. 11. Ball Thrust-bearing.

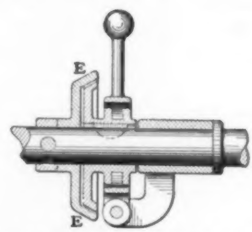

Fig. 13. Conical Clutch Faces.

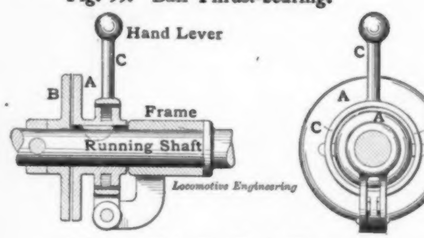

Fig. 12. Friction Clutch Elements.

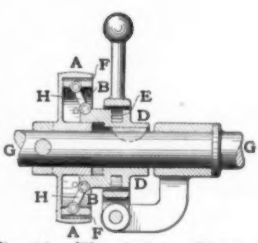

Fig. 14. Toggle Joint Clutch.

the meeting faces of *A* and *B*. The pressure must be great, and it is hard to hold the hand lever up all the time. These difficulties are often met by changing the shapes of *A* and *B*, as shown in Fig. 13, where the meeting surfaces are changed from disks to cones at *E*. This is a common form of clutch, much used in automobiles. It is very simple and cheap, is not very easily operated, and must be well oiled to prevent it from cutting and sticking. This clutch can be used, but it is very far from wholly satisfactory, as it may be difficult of disengagement and is not a good partial engagement driver. If oiled too freely it may not drive, and if not oiled enough it may refuse to let go, and may

and often does " cut " or " seize," so that no effort of the driver can release it.

In Fig. 14, an anti-friction element is placed between the clutch engaging surfaces. The introduction of this anti-friction element, *F*, is extremely beneficial, as it makes it certain that the engaging surfaces of the clutch will not cut and so destroy each other. At the same time, the anti-friction element is a great drawback to the effectiveness of the clutch as a whole, because it operates beneficially wholly by reducing friction, while the entire operation of the friction clutch demands the installation and maintenance of a very great friction. Hence if the anti-friction element is introduced much more powerful means of forcing the engaging parts of the clutch into contact with each other must be used than are required where the coacting surfaces of the clutch are of plain cast-iron, which is the material most commonly

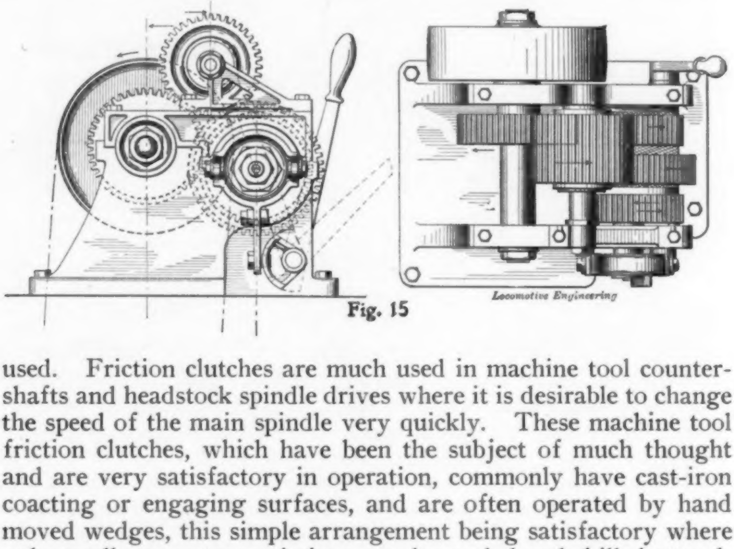

Fig. 15

used. Friction clutches are much used in machine tool countershafts and headstock spindle drives where it is desirable to change the speed of the main spindle very quickly. These machine tool friction clutches, which have been the subject of much thought and are very satisfactory in operation, commonly have cast-iron coacting or engaging surfaces, and are often operated by hand moved wedges, this simple arrangement being satisfactory where only small power transmissions are demanded and skilled attendance is always expected, and a slipping clutch power transmission is not only not demanded but it is inadmissible. The ideal automobile clutch must meet very different conditions. It must operate with ease and certainty without attention through long periods of action, and it must also be efficient as a slipping drive, by which a less speed may be transmitted than is normal, and a brake effect may be had. Because of these conditions the coact-

ing parts of the road wagon clutch should always be separated by an anti-friction element, vulcanized fiber, a well-known preparation of cotton, serving well in this position. Again, neither the plain lever nor the wedge nor cone serve exactly to fill the requirements of the automobile clutch, though both are in common use. The plain lever must be fitted with some locking device to maintain the pressure, and this is a very objectionable feature. The wedge sets up an enormous friction at a non-effective point, and may be very difficult of release. The screw, which is merely a continuous wedge wound about a cylinder, is open to the same objections as the wedge, although De Dion uses a screw operated friction clutch in an important capacity. The friction of a screw increases so rapidly with the load that the screw is quite unsuitable for actuating a friction clutch in automobiles, where delicate variations of a very heavy pressure are required to be made both quickly and easily.

There is another form of positive clutch, which consists in a sliding key traveling in a keyway cut in a shaft which supports the change gears, this sliding key having a projection which may be made to engage with any one of the notches cut in the hubs of all the loose change gears. Such a key in the form known as a "push-pin," is often used for changes of machine tool feed gears, and answers well where only very slow speeds are required. In the case of the automobile, the sliding key is almost the exact equivalent of the sliding shaft having the change gears fixed upon it. The sliding key has the advantage of permitting the change gears to be constantly in mesh, and operating on the hub of the gear, which has a much lower velocity than its teeth. The sliding key is, however, always a positive engagement, and hence cannot be used to obtain a brake effect, and is always likely to cause a breakage if used where the gears are running rapidly, and hence is wholly unfit for automobile use. In spite of these radical and prohibitive defects the sliding key has appeared in many late patents on wagon gears, and appears to find some favor in England, where automobile drivers seem quite resigned to facing accident and death whenever the brake fails to act on a down grade and the gearing turns too fast to prevent using the clumsy speed change clutches fitted to their vehicles. Serious and fatal accidents have occurred in many instances, solely because the speed change clutches were of such miserably unsuitable design that they could not be used when most urgently required.

Supposing a road wagon to be fitted with three speed changes for forward motion and one backing speed, and to be at rest on the road, with the motor in operation and all the speed change

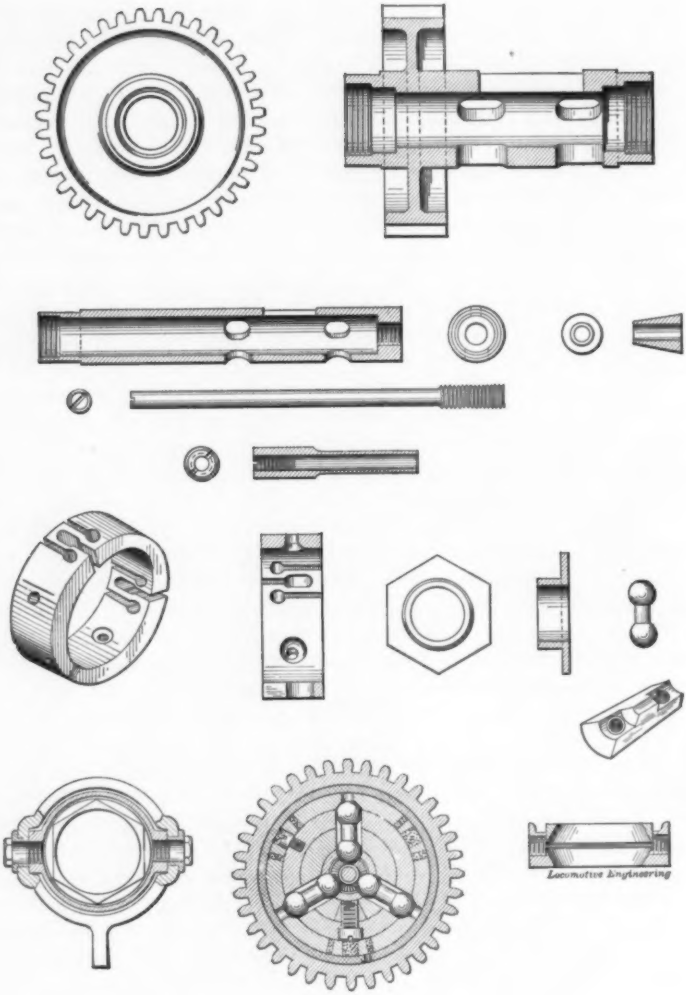

Fig. 16.

gears running at their normal rates. To start this wagon forward, a continuous motion of the speed controlling lever in one direction should successively bring all the forward driving gears into action, beginning with lowest speed and proceeding to the highest speed desired by the driver; the clutches should be so actuated that the slowest speed change gear would have a momentary engagement which should powerfully overcome the friction of rest of the wagon, which offers vastly more resistance to the initial movement of the vehicle than that due merely to the load and road surface. Then by a continued movement of the speed lever the next higher speed should be brought into action. This procedure gives the best acceleration possible with a constant speed motor and change gearing, and many patents have been taken out on this successive engagement feature, which is of the highest importance where speed change gears are used. For the backing action, it is needful that the speed and direction controlling lever should be capable of being moved instantly from its engaging position for any of the forward speeds to the backing speed, without engaging any of the intermediate lower forward speed changes. The Duryea Brothers have patented some ingenious belt drive operating devices meeting these automobile operating requirements, and other inventors disclose means of meeting these conditions, none of these patents being basic, all covering details only, and none of them, so far, giving wholly satisfactory results in operation.

Toggle joint actuated friction clutches are very widely used, and seem more suitable for the automobile than anything else, as by means of toggles heavy pressures may be established and removed with less friction of operating parts than by wedges or screws.

Fig. 14 shows a simple arrangement of members in a toggle joint actuated friction clutch, in which A is the constantly revolving driving member, B is an expansible metal ring fixed to the driven shaft G, F is an expansible ring of vulcanized fiber placed on the outer surface of B, and D is the sliding member splined to G, which is the member to be driven or released at will. The hub of D has a groove E, to take a lever fork, and is provided with opposite lugs to which the toggle members H, H^1, are jointed, the outer ends of H, H^1, being jointed to the expansible ring B. To operate this clutch the hub, D, must be moved to the left, so as to straighten the toggle links and expand the ring B and cause the fibre ring, F, to be very strongly pressed against the interior surface of the driving member, A. Such a clutch is self locking in position when the toggle members H, H^1,

are brought into a straight line with each other. The clutch is released by moving the sliding member, *D*, to the right. This is an extremely simple and reliable mechanism in the elementary form shown. It is very old, and open to the use of all. By giving the sliding member, *D*, only part of its total travel to the left a slipping engagement is readily, certainly and safely secured, and the toggle link pins are small and do not set up a heavy friction in action, so that this form of clutch is fairly easy to operate.

In practice this clutch, Fig. 14, gives trouble at the groove, *E*, where the lever fork engages the sliding member, *D*, where there are sliding surfaces difficult to lubricate efficiently. The length of the toggle links, H, H^1, must always be exactly such as will permit the links to stand in a straight line when the clutch is fully engaged, and as this length varies through wear of the parts it is found convenient in practice to make the links adjustable in length, the links being often made with threaded turn-buckle bodies fitted with check nuts. Obviously each link must be of correct length, and because the link adjustments are separate it is a matter of some delicacy to adjust them for harmonious operation. As shown in Fig. 14 the toggle joint friction clutch takes up room in the length of the shaft, and if a number of these clutches are placed on one shaft it is no simple matter to arrange a single clutch lever so as to handle the clutches in the sequence previously specified, so as to operate first the low speed, then the intermediate speed and then the high speed clutches, and yet be free to go at once to the reversing speed, not shown in Fig. 14, and it is common to fit a separate hand lever for each speed. This greatly simplifies the problem of the speed change clutch for the designer, but it does not simplify the labor of the driver, who must have his wits about him, and pick out the right lever for manipulation, no matter how imminent his danger of bodily injury may be.

Endless detail variations in the construction of the toggle actuated friction clutch are possible. Some of the latest of these variations are shown in Figs. 15, 16 and 17. This is a very elaborate toggle clutch design, particular care being taken to avoid friction and secure ready adjustments, and it includes the reversing gear and reversing action, thus giving a sure control of all the parts required for what is here spoken of as the "locomotive drive," in which no speed change gears are employed. One gear on the prime mover shaft drives one of the loose clutch gears, and also an intermediate gear which drives the other clutch gear in the opposite direction. A fourth gear, having a long hub on which the two clutch gears are mounted, is meshed with

The Final Automobile

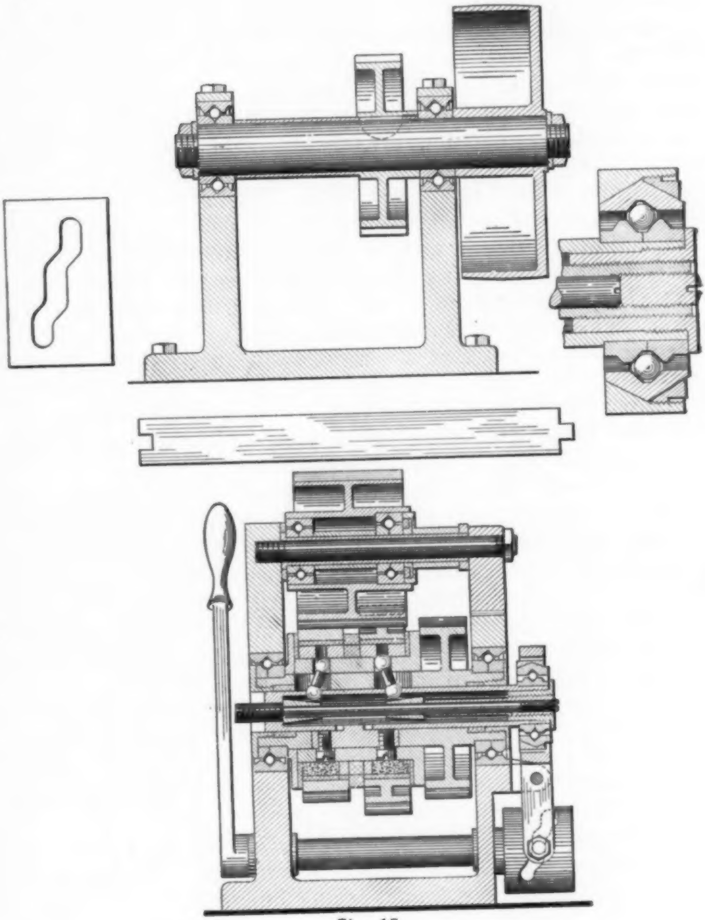

Fig. 17.

the balance gear drum, and is the member which is either left free or turned in either direction by the action of the clutch hand lever. The clutch hand lever is fixed to a rock shaft which carries a cam slotted segment for operating the clutch fork, the clutch fork being connected to the toggle actuating member sliding in the hub of the balance gear driving pinion, to actuate the two sets of toggles which respectively cause the engagement of either the forward or backward moving pinion with the balance gear driving pinion hub. As shown in the engravings neither set of toggles is in action. A quarter-inch of motion of the toggle actuating slide makes one or the other set of toggles effective, and so drives the balance gear drum driving pinion either forward or backward. The toggle members have globe ends, not pins, and are hardened, and are adjusted simultaneously, each set independently, by moving the hardened cones on which the inner ends of the toggle members are supported, by means of screws. The writer has carefully examined a clutch constructed in accordance with these drawings, Figs. 15, 16 and 17. It is very easily operated, is perfectly still, capable of action at any speed, and absolutely sure of release. The partial engagement gives a uniform slipping friction, great or small at the will of the operator, thus affording a reduced speed drive or a brake effect, as may be desired. It will be noticed that ball bearings are applied to this reversing clutch throughout, and that vulcanized fiber, distinguished by the cross-hatched sections, is interposed between all sliding surfaces. Felt oiling pads are so placed as to lubricate the clutch for a long period of time. All of this clutch is placed inside the gears, which are no larger in any dimension than their driving function demands, and are set as closely together as they will run, so that this clutch may be fairly said to occupy no space whatever, except that for the hand lever and its shaft, and the cam segment and the fork. The fork has a ball bearing connection with the toggle actuating slide, and so needs no lubrication.

The vast importance and significance of a reversing clutch of perfect action will now be set forth.

Returning to the initial supposition that the final automobile is equipped with a cylinder-fired motor running in one direction only, and measuring a definite variable bulk of fuel and of air to its cylinders for each working piston stroke, it is very clear that if suitable change gearing and clutches can be had the hitherto intractible Otto cycle internal combustion motor becomes an ideal agent for road wagon driving, if a sufficient number of cylinders are introduced to give a constant motor shaft torque. It is common now to use four motor cylinders, giving something near the

same crank shaft torque which is given by a single cylinder, double acting steam engine. Go a step beyond, and use five or six cylinders, and the turning impulse given to the motor shaft will be nearly constant, and no fly-wheel need be used. If the motor has no vibration and so can be run constantly whether the wagon is standing or going, it then becomes as constant and certain a producer of motive power as a steam boiler, and has the vast advantage over a steam boiler of being able to instantly vary the fuel consumption and power production, from barely enough to keep the motor shaft turning to the maximum, all as long and vainly sought by the flash and hot bath fired boiler makers, who have endeavored to produce boilers which would instantly vary the pressure and volume of steam production to suit the immediate demands for motive power.

With steam, the difficulties lie wholly with the fire and the water; after the steam is once produced it is easy to make it drive a wagon to suit the occasion. The cylinder-fired motor has no boiler and needs no water renewals. With liquid fuel the steam boiler fire can be instantly varied in any degree either up or down, and if the boiler tubes are thin enough, and are also numerous enough to nearly fill the boiler shell, then the steam production will very closely follow the fire regulation, and the power production can be varied almost as readily as with the cylinder-fired motor. Friction clutches are, however, far more docile and easily managed and maintained agents than are the demons we bottle up in steam boilers, and it is next to impossible to produce a steam driven motor wagon which is really safe against self-destruction by fire, while it is an easy matter to make the cylinder-fired motor absolutely incapable of burning anything outside of the fuel charges fired safely in the hidden recesses of its own cylinders.

Because of all this the clutch becomes the most important feature of the final automobile, after the motor.

Given a constant shaft torque, varied in power instantly and at will of the driver, and satisfactory transmission elements between the motor shaft and the driving wheels, the cylinder-fired motor becomes exactly what a steam motor would be if always supplied with much or little steam as desired, without having to use any boiler or water whatever, and these ideal conditions will almost certainly be met in the final automobile by the use of reliable friction clutches.

The fact that the cylinder-fired motor is instantly made strong or weak by fuel charge variations is perfectly well known, and it is also well understood that each working stroke of a cylinder-

fired motor is an event by itself, commencing with the stroke and ending with the stroke, and that there is no reserve of motive power, or aggregation of motive power producing elements in constant action, in the case of the cylinder-fired motor as there is in case of the steam boiler. It is also generally believed that this lack of a power reservoir makes the internal combustion motor greatly less certain in wagon-driving action than the steam boiler.

Hence it is not generally believed that the cylinder-fired motor can be a more easily and perfectly controlled heat motor than the steam boiler, because the fired steam boiler is always alive and eager to find an outlet for the pressure which it generates.

The truth is, that the continuous action of the water filled steam boiler makes it impossible to regulate its power production exactly to the requirements of the instant. The boiler keeps on making steam whether the wagon needs steam or not, and with ordinary steam boiler elements of control, more steam is sometimes made than can be used. By the introduction of diaphragm regulators operated by steam pressure, needle valve fuel admission, and the use of the lighter hydrocarbons for fuel, with the fuel in the fuel tank under an air pressure of from 25 to 40 pounds, also maintained by the use of the diaphragm to automatically control the operation of an intermittingly working air pump, the steam production of a steam boiler may be regulated to the greatest nicety, without care on the part of the wagon driver, provided the boiler water level, the fuel needle valve, and the fuel tank air pressure are all automatically controlled. When these functions are so controlled, it is at the expense of a vastly complicated aggregation of delicate parts, which are so highly objectionable as to be rejected altogether by some steam wagon users, and which the flash boiler advocates avoid by other highly objectionable methods.

In the case of the cylinder-fired prime mover, the fact of the self-terminating action of the working stroke obviates all of these difficulties, because it is only needful to measure a variable quantity of cold fuel and cold air to the motor for each working stroke to produce an instantly variable power production; this highly desirable effect cannot be had in full perfection, however, without a fairly constant torque on the motor shaft, which must be gained either by the use of a heavy fly-wheel or by providing from four to six cylinders. The fly-wheel introduces weight and the four, five or six cylinders vastly increase the number of working parts, but even with the extreme number of six working cylinders, the internal combustion motor is a much less delicate and less com-

plicated prime mover than the full automatically regulated steam boiler.

Because of all this, the cylinder-fired motor is more suitable for wagon driving at large, both for heavy and light service, than the steam motor, provided that a perfectly suitable clutch can be had capable of performing the more important functions of the link valve motion.

The Sargent Gas Engine Oiler

OF oilers for engines of different kinds there are quite a variety and many to choose from. The Michigan Lubricator Company, of No. 257 Beaubien Street, Detroit, manufactures an oiler which has proved eminently satisfactory for lubrication of the cylinder and piston of gas or oil engines, which, of course, is one of the essential conditions of successful operation.

In the case of automobile engines the amount of oil should be in proportion to the number of revolutions made per minute, and should stop feeding oil when the engine stops, as too much oil means smoke, and too little a cutting of the cylinder or piston.

The oiler referred to consists of a glass reservoir, which is filled through a hole in the top normally covered by a slide; a needle valve adjusts the feed into the air-tight bullseye below and a check valve held to its seat by a spring, the compression of which is adjusted by a nut, which can be turned with a screw-driver.

When this oiler is used for admitting oil to the cylinder of a gas engine or air compressor the check valve spring is so adjusted that the valve seats when the air pressure above and below the check is the same, but if the air pressure below the check valve is rarified or slightly reduced the check will open and allow the air in the bullseye inclosure to pass into the cylinder, whereupon the atmospheric pressure on the oil in the reservoir will force it down through the needle valve to the bullseye chamber from which it will pass into the cylinder every time the check valve opens. When the engine stops rarification in the cylinder ceases, the check valve remains seated and the oil stops feeding through the needle valve, because oil cannot drop into the bullseye chamber if air and oil are not drawn out. The reservoir can be filled while the engine is stopped or running without opening or closing a valve or changing the adjustment of feed.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Illustrated articles are designated by an asterisk (*).

Autocar for Heavy Traffic, The—

*An article devoted to the pointing out of the great advantages to be obtained from the use of motor vehicles in the transportation of merchandise. "The Autocar," London, October 20, 1900.

Automobile—

*A description of the Meynier and Legros electric automobile for four passengers, shown at the Paris Exposition. The weight is 2,750 pounds. The battery consists of 48 Fulmen cells. The motor has two independent ring armatures outside of the field. Four different speeds are obtained by series parallel control of the two halves of the battery, by series and parallel connection of the two armatures, and by shunting the series field for the highest speed. "L'Ind. Elec.," September 10, 1900.

Automobile, The Gillet-Forest—

*A very complete article devoted to the description of an automobile which contains a number of interesting points. "La Locomotion Automobile," Paris, October 25, 1900.

Bicycle Motor—

*An article upon a motor bicycle having a number of new features. "The Bicycling World," New York, October 25, 1900.

Canal Boat Haulage, Motor Cars For—

*Description of a carriage of curious construction intended for towing canal boats. "The Motor Car Journal," London, October 27, 1900.

Engines, Four Cycle Internal Heat—

An article devoted to the subject of the efficiency of port-valves. "The Motor Car World," London, October, 1900.

Exposition, Automobiles at the Paris—

An article by G. F. Desjaques, devoted to the description of the different motor vehicles on exhibition. "Engineering," London, October 19, 1900.

Fire Engine, Self Propelled—

*A description of an engine constructed by Messrs. Merryweather & Sons, Ltd. "The Motor Car World," London, October, 1900.

Gasoline Motor—

*A description of the Howard motor, which is of the four cycle type. "The Motor Age," Chicago, October 25, 1900.

Gears, About Change—

Second article of a series by M. C. Krarup, on the problems connected with the regulation of the speed of motors. "The Motor Age," Chicago, October 25, 1900.

Gear, The Anil Two Speed—

*Description of a new form of gear more particularly suited to quadricycles and tricycles. "The Autocar," London, November 3, 1900.

Locomotion, Road—

Extracts from a paper read by Prof. Hele Shaw before the Institution of Mechanical Engineers. "The Motor Car World," London, October, 1900.

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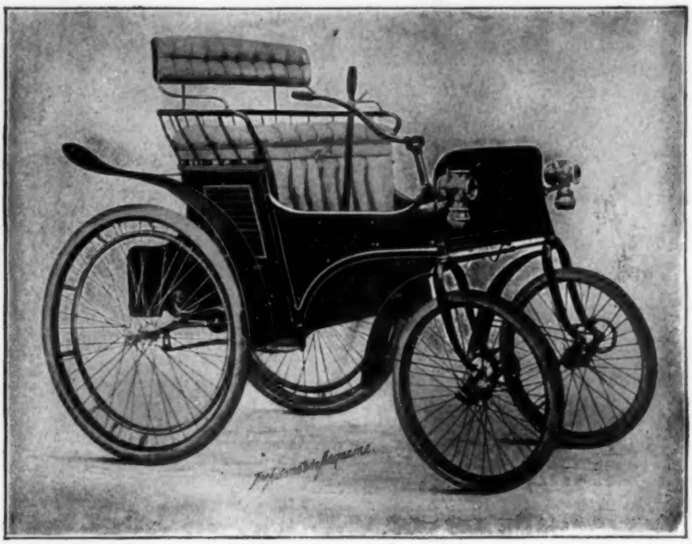

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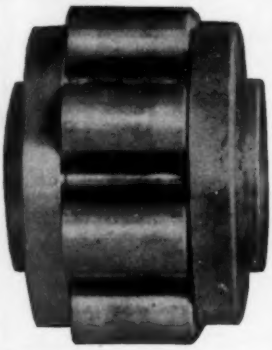

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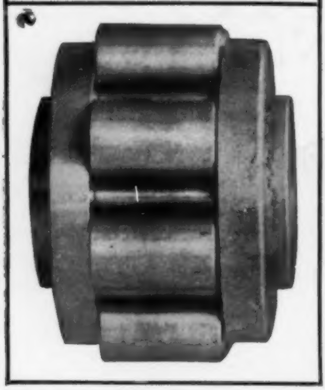

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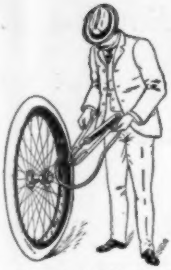

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The Automobile Magazine

VOL. II MAY 1900 No. 2

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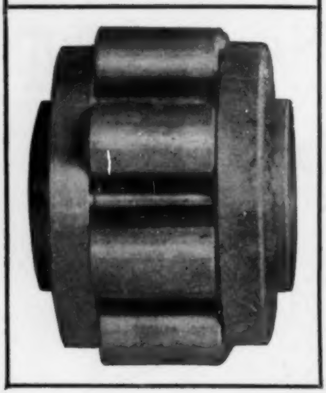

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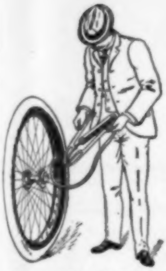

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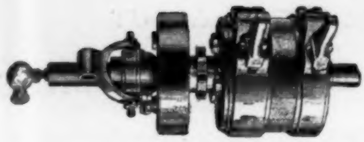

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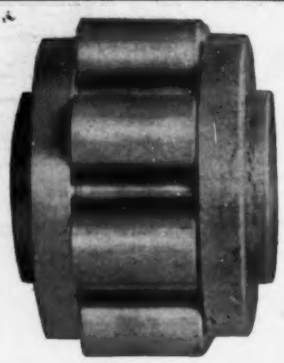

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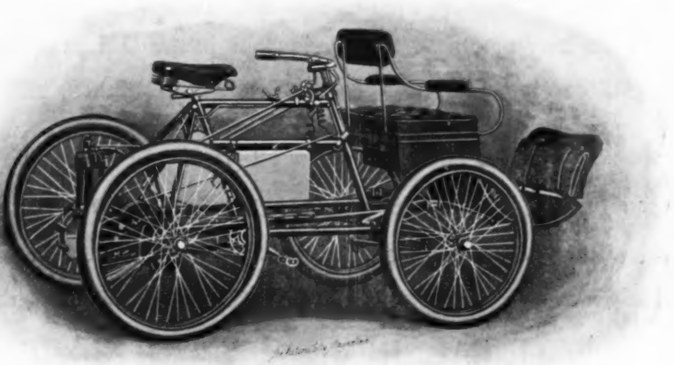

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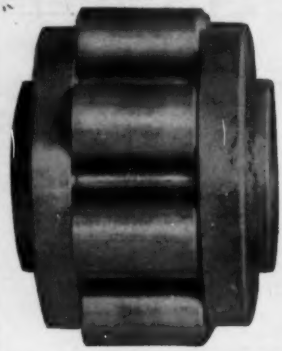

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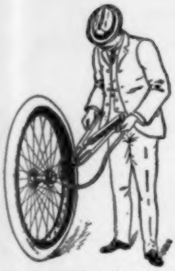

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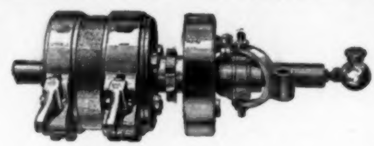

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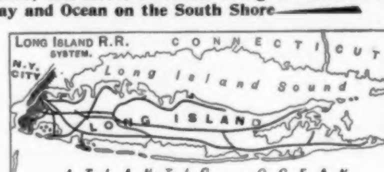

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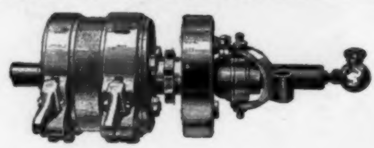

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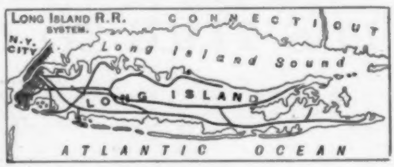

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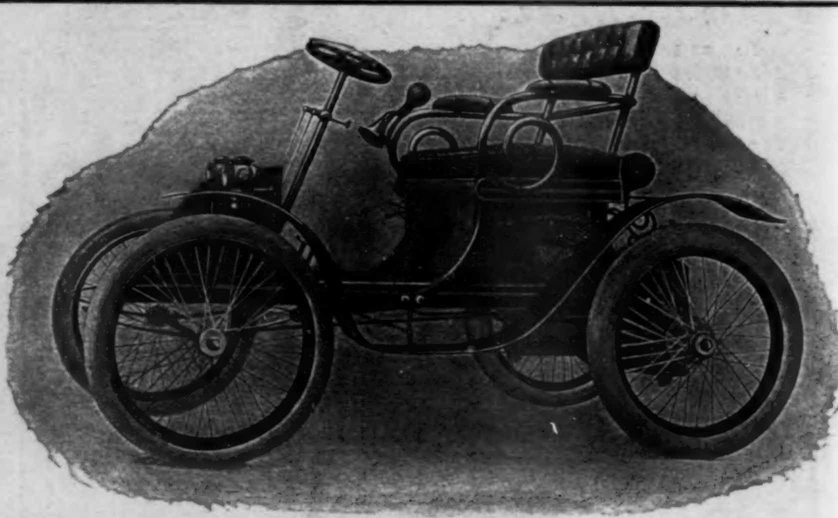

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